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NATIONAL DAM INSPECTION PROGRAM. UPPER ROCK CREEK WATERSHED SIT--ETC(U)
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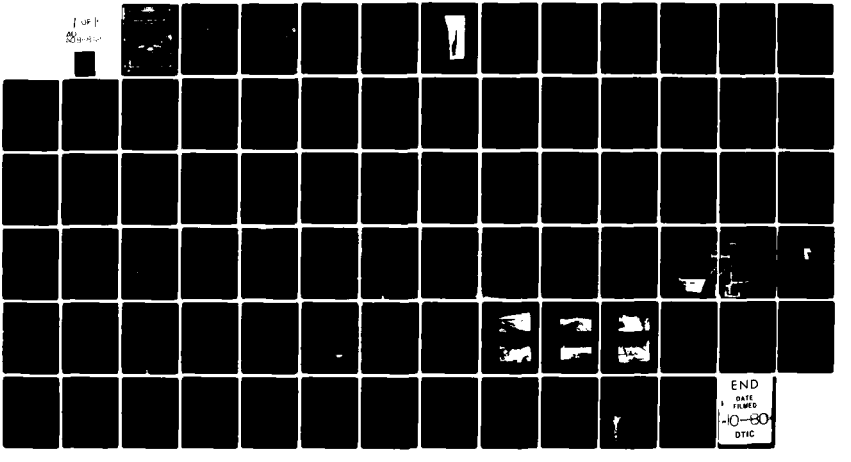

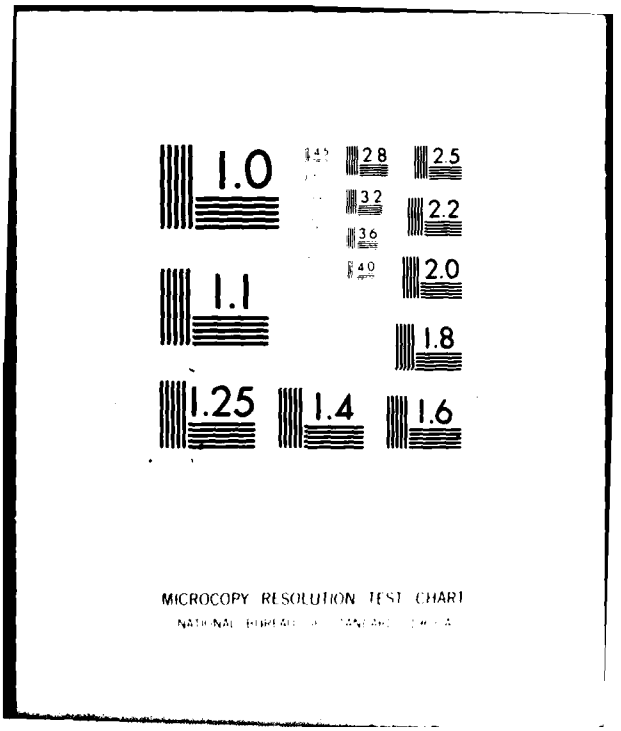
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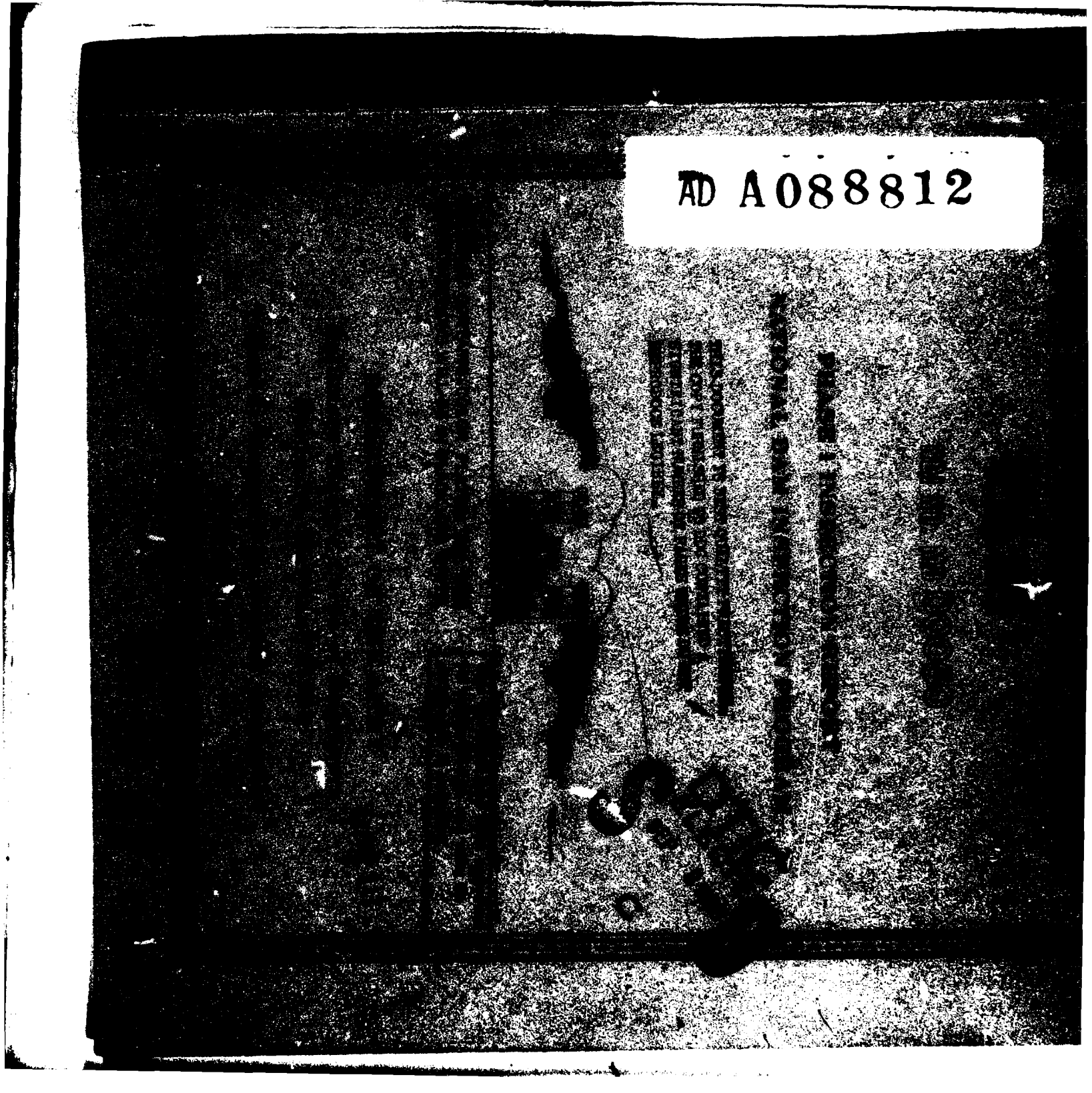

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POTOMAC RIVER BASIN

(6) National Dam Inspection Program

Potomac River Basin

UPPER ROCK CREEK WATERSHED SITE #1
(LAKE BERNARD FRANK)
MONTGOMERY COUNTY, MARYLAND
(NDI-[redacted]-MD-00050)

Number

PHASE I INSPECTION REPORT
~~NATIONAL DAM SAFETY PROGRAM~~

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: WATER RESOURCES ADMINISTRATION
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Annapolis, Maryland 21401

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Date: Aug[redacted] 79

memo of understanding between State of Md and Corps.

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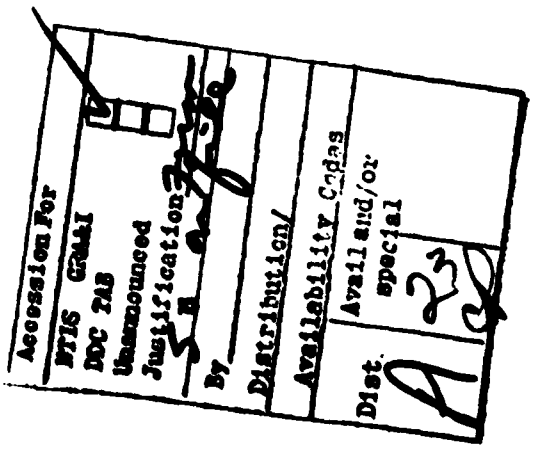
PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM:	Upper Rock Creek Watershed Site #1 (Lake Bernard Frank)
STATE:	Maryland
COUNTY:	Montgomery
STREAM:	Upper Rock Creek
DATE OF INSPECTION:	June 15, 1979

ASSESSMENT: Based on the evaluation of the conditions as they existed on the date of the inspection and as revealed by visual observations, the condition of the dam at Upper Rock Creek Site #1 (Lake Bernard Frank) is assessed to be good. This dam is an intermediate size class I structure.

The spillway capacity is classified as adequate because it will pass the recommended spillway design flood of full Probable Maximum Flood according to the recommended criteria.

The following remedial measures and recommendations should be implemented as soon as possible:

1. Re-establish the design normal pool by clearing debris from the ungated orifices within the cold water release chamber.

2. Re-establish the operating condition of all gated orifices within the cold water release chamber and principal spillway riser.

3. Document operating procedures in writing.

4. Develop a warning system to warn downstream residents of large spillway discharges during periods of heavy rainfall and runoff or failure of the dam.

5. Re-establish vegetation on the left side of the downstream face of the dam and on the berm separating the dam and emergency spillway.

6. Implement rodent control and refill existing burrows.

SUBMITTED BY: WATER RESOURCES ADMINISTRATION
DAM SAFETY DIVISION

Date

APPROVED BY:

11 Sep 79
Date

James W. Peck
Colonel, Corps of Engineers
District Engineer

UPPER ROCK CREEK WATERSHED SITE #1
LAKE FRANK
MD 00050

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APPENDIX B - Check List, Engineering Data, Design, Construction, Operation, Phase I

APPENDIX C - Location Map and Plans

APPENDIX D - Photographs

APPENDIX E - Analyses

APPENDIX F - Geology Report

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
UPPER ROCK CREEK WATERSHED SITE #1
(LAKE BERNARD FRANK)
NDI NO. MD 0050

SECTION 1
PROJECT INFORMATION

1.1. General

a. Authority. The inspection was performed pursuant to the authority granted by the National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. The dam at Upper Rock Creek Site #1, known locally as Lake Bernard Frank, consists of a compacted zoned earth fill embankment approximately 78 feet high and 576 feet long. A cutoff trench, 30 feet wide, extends to the weathered rock in the foundation, at the dam's longitudinal centerline. At the same location, a grout curtain was installed on the left floodplain and left abutment. The grassed slopes rise at 3H:1V upstream and downstream A 20 foot berm is located on the upstream slope one foot below normal pool at elevation 297.0. Rock riprap extends from elevation 297.0 to elevation 302.0. The principal spillway riser concrete control towers connects to a 42-inch concrete outlet pipe which discharges to an impact basin. These facilities discharge uncontrolled normal flows up to the calculated 100 year frequency flood event and cold water releases through three gated inlets. Flood flows exceeding the calculated 100 year flood levels may be discharged through a trapezoidal grassed emergency spillway located beyond the left abutment. The emergency spillway crest is 36.5 feet above the normal pool elevation and 13.4 feet below the top of dam elevation.

b. Location. Lake Frank is located approximately 2 miles northeast of Rockville in Montgomery County, Maryland. The structure impounds Rock Creek, eventually flowing through Washington, D.C. to the Potomac River.

c. Size Classification. The maximum height of the dam is 78 feet. The reservoir volume to the top of the dam at elevation 347.9 is 7854 acre-feet. Therefore, the dam is in the "intermediate" size category.

d. Hazard Classification. Damage to downstream roads, intensely used recreational areas, and loss of more than a few lives would likely result from a failure of the dam. Accordingly, the dam is classified in the high hazard category.

e. Ownership. Lake Frank is owned by the Maryland National Capital Park and Planning Commission, 6700 Needwood Road, Derwood, Maryland.

f. Purpose of Dam. The dam provides the multiple purposes of flood control and recreation.

g. Design and Construction History. The structure was designed by the Soil Conservation Service, Engineering and Watershed Planning Unit, Upper Darby Pennsylvania, in 1965. Construction was accomplished by Dewey Jordan, Inc. of Frederick, Maryland and directed by the Soil Conservation Service. Construction began on December 9, 1965, and was completed on May 26, 1967.

h. Normal Operating Procedure. The dam operates as an uncontrolled structure. Normally, the pool level is maintained at elevation 298.0 by passage of base flows into the riser tower through the twin ungated orifices.

1.3 Pertinent Data

a. Drainage Area. Lake Bernard Frank has a drainage area of 12.23 square miles.

b. Discharge at Dam Site. The maximum discharge at the dam site through the emergency spillway at elevation 334.5 is 24,317 cubic feet/sec. The maximum flood discharge at the dam site is unknown. However, Hurricane Agnes in June, 1972 caused a rise in pool elevation on to the approach slope of the emergency spillway approximately 35 feet above the normal pool.

c. Elevation (feet above mean sea level)

Top of Dam	347.9
Design High Water	338.7
Emergency Spillway Crest	334.5
Principal Spillway Riser Crest	314.5
Normal Pool	298.0
Streambed at Centerline of Dam	270.2

d. Reservoir (Miles)

Length of maximum pool	1.74
Length of normal pool	1.06

e. Storage (acre feet)

Normal pool	785
Principal Spillway Riser Crest	1980
Emergency Spillway Crest	4679
Design High Water	5544
Top of Dam	7854

f. Reservoir Surface (acres)

Top of dam	219
Design High Water	217
Emergency Spillway Crest	189
Principal Spillway Riser Crest	92
Normal Pool	56

g. Dam

Type	Earthfill
Length (feet)	576
Height (feet)	78
Top width (feet)	22
Side slopes - Upstream	3H:1V, 20 ft berm one ft.below normal pool
- Downstream	3H:1V
Impervious Core	Zoned construction
Cutoff trench	Compacted earthfill at dam centerline 30 ft. bottom width, 1H:1V side slopes, 20 ft. maximum vertical depth
Foundation Seepage Control	Twin grout curtains, 5 ft. up and downstream of dam centerline

h. Diversion and Regulating Tunnel

None

i. Emergency Spillway

Type	Trapezoidal, grassed, cut into natural earth beyond left abutment
Bottom width at control section	150 feet
Crest elevation (feet above M.S.L.)	334.5
Gates	None
Approach Slope (%)	1
Exit slope (%)	2.5
Total Length (ft)	656
Downstream channel	Spillway discharges perpendicular to dam axis to Rock Creek

j. Principal Spillway

Type	Reinforced concrete riser and 42 inch diameter R.C. outlet pipe
Riser height	49.5 ft.
Riser crest elevation (MSL)	314.5
Riser dimensions	
Inside	3.5 x 10.5 ft.
Outside	5.5 x 12.5 ft

Length of Weir at elevation 314.5	2 @ 10.5 ft.
Length of connecting 42 inch pipe	Approximately 460 ft.

k. Regulating Outlets

Gated	3-24-in. dia. Rodney Hunt	280 Series Sluice Gates @ elev. 290.33 for cold water release @ elev. 281.42 for cold water release @ elev. 273.00 for drain
	1-Shop fabricated Sluice	2 x 3.5 ft. @ elev. 272.50 for cold water release
Ungated	2-2 x 3 ft. openings	@ elev. 299.25 for normal release

SECTION 2

ENGINEERING DATA

2.1 Design:

a. Data Available: The dam at Upper Rock Creek Watershed Site No. 1, Lake Bernard Frank Dam, was designed by the Soil Conservation Service, Engineering and Planning Unit, Upper Darby, Pennsylvania in 1965. The engineering data reviewed for this project consists of an Engineer's Design Report, construction and material specifications, as-built drawings dated January 1965, February 1965, and May 1966, an Engineer's Report on Construction and Test Results for Upper Rock Creek Site No. 1, and Annual Operation and Maintenance Inspection Reports. A portion of the drawings are presented in Appendix "C", Location Map and Plans. The design report contains hydrologic and hydraulic data, a geology report, laboratory soil test results including consolidation and consolidated undrained triaxial tests for representative soil samples, slope stability studies, settlement analyses, estimates of seepage quantities through the foundation, structural analyses of appurtenant structures, and material quantity estimates. Logs of subsurface explorations including rock cores and water pressure tests are contained in the design drawings.

b. Design Features

1. Hydrology and Hydraulics - The top of dam and the configuration of the outlet works were designed in accordance with Soil Conservation Service criteria for a Class "C" structure which corresponds to a high hazard dam as defined by the Phase I inspection guidelines. A complete discussion of the hydrologic and hydraulic design is contained in Section 5.

2. Embankment - The design drawings and specifications indicate the embankment to be zoned earth fill rolled to a minimum density of 95 per cent of the maximum dry density attained in accordance with the Standard Proctor Test (ASTM Standard D-698). The embankment is placed upon a foundation of medium dense to dense residual soil on the abutments and alluvial soil in the stream valley which were prepared by clearing and grubbing operations. Based upon recommendations in the geology report, the design drawings provide for a grout curtain cutoff on the left side of the dam. A cutoff trench of impervious soil extends several feet into weathered rock with variable side slopes and bottom widths which vary from 20 feet to 30 feet. The cutoff trench is continuous with an impervious zone in the embankment which extends from the base of the dam to elevation 3345 corresponding to the crest of the emergency spillway. The centerline of the impervious core is slightly downstream of, and parallel to, the centerline of the dam. Both the trench and impervious zone were to be constructed of residual low plasticity silt excavated from the floor of the emergency spillway and nearby supplemental borrow areas.

The main portion of the embankment consists of silty sand placed at a 3H to 1V configuration for both the upstream and downstream slopes. A berm, 20 feet in width, was constructed one foot below the normal pool elevation of 298.0. Riprap slope protection extends from the berm to a level 5 feet above the berm.

Internal drainage of the embankment is provided by filter trenches draining to a rock fill toe on the downstream side of the dam. The filter trenches are situated along the left and right downstream abutments, extend vertically from the stripped groundline to a level about 3 feet below the weathered rock horizon, and drain into the rock fill of the downstream toe. The trenches are constructed of well graded sand and gravel designed in accordance with methods recommended by the U.S.D.I., Bureau of Reclamation. The rock fill at the downstream toe is surrounded by a graded filter to provide free drainage of the internal seepage control system without migration of fines from the embankment and foundation. A 36-inch interceptor sewer constructed just prior to construction of the dam passes through the foundation near the left abutment. The design report contains working drawings showing special treatment of the sewer line consisting of two anti-seep collars and compacted impervious backfill in the pipe trench. No records documenting compliance with the details of the design report were found during the data review.

3. Appurtenant Structures - An overflow spillway riser of reinforced concrete is located on the left side of the dam and is drained by a 42-inch reinforced concrete pipe extending through the embankment to a reinforced concrete impact plunge pool. The riser structure is supported on a concrete pad with the foundation level to be determined during construction by the Engineer.

The spillway pipe is supported along most of its length by a reinforced concrete cradle and is surrounded by fourteen concrete anti-seep collars, 14 feet wide by 9 feet high minimum, placed at intervals of 24 feet. The spillway pipe trench is over-excavated to a level close to the top of weathered rock and backfilled with impervious material to the pipe foundation level.

The riser tower contains a gate controlled drain with an intake invert at elevation 273.0, two 24-inch diameter gate controlled cold water intakes at elevations 281.4 and 290.3, two low stage orifices at elevation 299.2, and two high stage weirs with crest elevations at 314.5. The low stage and high stage intakes are provided with trash racks.

The emergency spillway is located beyond the left abutment of the dam and is formed by cut into weathered schist material. The emergency spillway floor is 150 feet in width, rises at a grade of 1% for a length of 189 feet, reaches a 30 foot wide level crest at elevation 334.5, and drops at a grade of 2.5% for 506 feet. The side slopes of the emergency spillway are constructed at 2 1/2H to 1V in soil on the right side and 1H to 1V in rock on the left side.

2.2 Construction: Construction Specifications, as-built drawings, and an "Engineer's Report on Construction and Test Results" are the available construction documents. The as-built drawings generally reflect the intent of the design report, design drawings and existing conditions. The as-built drawings and the construction report indicate the details of the grouting program for the foundation on the left side of the dam including the spacing, depth, and grout quantities for each grout hole. The results of concrete strength tests and in-place density tests on the embankment indicate that the requirements of the construction specifications were attained.

The construction documents refer to a modification of the internal drainage system whereby the top elevation of the rock fill and the pervious zone on the downstream side of the dam were raised. Also, the gradation of the rock fill was finer than anticipated in the design due to disaggregation during handling and placement. Several permeability and mechanical analyses tests were performed on the in-place rock fill during construction to verify the adequacy of the specified filter material and the efficiency of the rock fill drain. The specified filter material was found to be adequate, but the efficiency of the rock fill toe drain was judged to be marginal and a supplemental drain was installed along the right side of the dam at the downstream toe. The supplemental drain consists of a 12-inch diameter perforated corrugated metal pipe which is surrounded by filter material and drains to the impact basin.

Special treatment of foundations for the concrete spillway riser and outlet impact basin were not found in the construction documents. Apparently, these structures were placed upon compacted fill as shown on the design drawings.

2.3 Operation. Lake Bernard Frank Dam was designed primarily as a self operating flood control structure with uncontrolled outlet works. Secondary benefits are to be derived from water recreation activities for Rock Creek Park operated by the Maryland National Capital Park and Planning Commission. Reports entitled "Annual Operation and Maintenance Inspection" are prepared by the Montgomery County Soil Conservation District and the owner on a regular basis. The only operational features on the dam are cold water intake gates on the spillway riser for downstream water quality. A cable controlled slide gate drain is also located at the base of the riser. At the time of inspection the cable was severed and the gate was inoperable.

2.4 Evaluation

a. Availability. The Design Report, design drawings, construction specifications, as-built drawings and the Engineer's report on construction are available in the files of the State of Maryland Water Resources Administration, Dam Safety Division and the Soil Conservation Service.

b. Adequacy. The available data is complete and adequate to evaluate the dam and appurtenant structure for the purposes of a Phase I study. Based upon review of this data the facility generally has been

designed in accordance with accepted engineering practice.

c. Operating Records. The only written operating records are the Annual Operation and Maintenance Inspection reports prepared by the local Soil Conservation District and the owner.

d. Post Construction Changes. There are no major post construction changes.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection, June 15, 1979. The complete visual inspection check list is presented in Appendix A.

b. Dam.

1. There is no cracking, sloughing or other appreciable movement in the embankment.

2. The vertical and horizontal alignment are good with no evidence of additional settlement beyond that provided by the as-built camber.

3. At the time of the inspection, there were no noticeable seepage areas.

4. There were several animal burrows located on both the upstream and downstream slopes.

5. There were vehicle tracks on the downstream face of the dam and beyond the left abutment leading to the emergency spillway.

6. A small slump exists at the top of the emergency spillway backslope (leftside) slightly upstream of the control section.

c. Appurtenant Structures.

1. The concrete associated with the impact basin, and visible portions of the intake tower were in good condition.

2. Beyond the impact basin, the outfall channel bottom has a slight accumulation of riprap.

3. Partially clogged orifices, a broken cable operating a drain gate, and two inoperable of three gated inlets are resulting in a pool elevation approximately 8.5 feet above normal. On March 9, 1979 an photograph was taken that revealed the pool level to be approximately 16 feet above normal.

d. Reservoir Area. The reservoir slopes are primarily wooded. There is slight erosion around the present pool level due to foot traffic. Sedimentation is reported by the owner in the upper reaches of the pool area.

e. Downstream Channel. The discharges from the principal spillway and emergency spillway during rare flood events flow into Rock Creek via separate channels. In the immediate vicinity of the dam, Rock Creek flows beneath the Maryland Route 28 bridge and through parkland owned and operated by the Maryland National Capital Park and Planning

Commission. The present demand of these lands as a recreational facility is reported to be 500,000 visitors annually.

3.2 Evaluation.

a. Dam. The animal burrows and vehicle tracks if unattended could lead to more serious erosion, but, at this time, do not affect the dam's stability or flood discharge capacity. The small slump on the emergency spillway backslope should be periodically checked, but at this time is believed to be surface sloughing based upon visual observation. Based upon the rock fragments and schist elevation encountered during the subsurface exploration in the area, any adverse effect of a potential blockage within the emergency spillway is judged to be minimal.

b. Appurtenant Structures. The deficiencies associated with the intake tower are causing higher than normal pool levels. Besides hampering visual inspection and routine maintenance capabilities, the designed freeboard is presently adversely affected since the present pool exceeds the S.C.S. 10 day drawdown level starting from which the Freeboard Hydrograph was applied. These considerations dictate that the deficiencies enumerated in 3.1c.3 above be rectified as soon as possible.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure. The purpose of the dam at Upper Rock Creek Site #1 is to provide for recreation and flood control. Discharges to the downstream areas are uncontrolled through the intake tower and thence through the 42 inch concrete outlet pipe. Additionally, three different levels of controlled cold water releases may be accomplished.

4.2 Maintenance of the Dam. No written maintenance program has been established, but the general appearance of the dam indicates a high degree of care. The Maryland National Capital Park and Planning Commission is responsible for maintaining the dam. It should be noted that the owner has, in the past, requested, recieved and followed advice of the Soil Conservation Service.

4.3 Maintenance of Operating Facilities. Reportedly, the inoperative conditions at the intake tower have spanned the last year. A written operating and maintenance policy should preclude, in the future, a similar condition.

4.4 Warning System. There is no formal warning system in effect.

4.5 Evaluation. The general operational procedures are satisfactory except that no formal warning system is in effect and maintenance procedures are unwritten.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. The dam at Upper Rock Creek Watershed Site #1 was designed for recreational and flood control purposes. The complete hydraulic design, satisfying the Soil Conservation Service's class "C" criteria, is included as Section III of the Engineer's Design Report dated March, 1965. The development of the inflow design flood under class "C" criteria closely approximates the recommended Spillway Design Flood of the full Probable Maximum Flood (PMF). According to the Design Report, the crest of the principal spillway riser is at the elevation attained by a 10 year frequency flood event. The crest of the emergency spillway was set at the elevation attained by the 100 year frequency flood event. Design High Water was then calculated by routing a flood hydrograph having 8.6 watershed inches of runoff volume but starting at a pool elevation approximately 6 feet above normal pool to account for possible multiple storm events. The top of the embankment was set by routing a flood hydrograph having 24.7 watershed inches of runoff volume with the same assumption of starting elevation.

b. Experience Data. As previously stated, the dam at Upper Rock Creek Watershed Site #1 is classified as an intermediate size dam in the high hazard category. Under the recommended criteria for evaluating spillway discharge capacity, such structures are required to pass the Probable Maximum Flood (PMF). Since the dam was constructed, the maximum pool elevation was attained during Hurricane Agnes in 1972 and reportedly reached within 1 foot of the emergency spillway crest. According to the Design Report, the storm of record (August, 1933) would have reached pool elevation 336.6, or approximately 2 feet above the emergency spillway crest. No written or verbal records indicate that the emergency spillway has been activated.

c. Visual Observations. On the date of the inspection no conditions were observed that would indicate that the emergency spillway of the dam could not operate satisfactorily in the event of a flood. However, the inoperative conditions at the intake tower increase the probability of flows through the emergency spillway.

d. Overtopping Potential. To check the Freeboard Hydrograph procedure as applied to the dam, the full PMF inflow hydrograph was routed through Lake Frank according to the recommended guidelines. The results are presented in Appendix E. The analyses indicate that the full PMF can be discharged without overtopping the embankment.

e. Spillway Adequacy. The Design Report together with the current results indicate that the reservoir storage and spillway capacity can discharge the full PMF. Accordingly, the spillway is considered adequate.

f. Downstream Conditions. As previously discussed in Section 3, damages, as a result of dam failure, to Rock Creek Park, and State roads are considered likely. Due to the heavy recreational use, loss of life is probable.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. No visible signs of appreciable movement or distress were detected in the earthen embankment or appurtenant structures. No seepage points or wet zones were detected on the downstream face of the dam, at the toe or beyond the toe. The water in the impact basin was clear and no indication of loss of embankment or internal drain filter material was detected. The vegetative cover of the emergency spillway was well established and the side slopes generally uniform and stable with the exception of a small localized slide on the left side. Other than debris clogged intakes and the inoperative drain gate, visual observations revealed the dam and appurtenant structures to be in good condition.

b. Design and Construction Data.

1. Embankment. Based upon the subsurface data, the embankment was placed on dense to medium dense residual soil which appears competent to support the design load. Consolidation tests were performed on a portion of the least dense silt sample obtained during the foundation exploration and a representative embankment sample from the borrow area. A settlement analysis utilizing the test results indicated that approximately .7 feet of foundation settlement and 2 feet of embankment settlement were anticipated in the design. A clay sample within the foundation soil was subjected to triaxial testing and the strength parameters of $\emptyset$ equal to 25.5° and cohesion equal to 325 p.s.f. were utilized in slope stability analyses.

Representative samples of compacted embankment material were also subjected to triaxial testing and average strength values of $\emptyset$ equal to 27.5°, 32.0°, and 33.5°, and C equal to 300, 325, and 175 p.s.f. were recommended for use in slope stability studies for embankment zones 1, 2, and 3, respectively. These values are considered reasonable for effective stress analysis of the clayey silts, silts and silty sands utilized for the embankment construction. Slope stability analyses were performed for the upstream slope utilizing the Swedish Circle method with the slide arc assumed to occur at various positions. Fifteen trials were performed for two upstream berm widths and the lowest factor of safety computed was 1.31 which was derived for a berm 12 feet in width. Based upon this analysis, the berm width was increased to 20 feet. The downstream slope was also analyzed by the Swedish Circle method which yielded a minimum factor of safety of 1.69 assuming the slide to occur through the foundation materials. Based upon the design review, these analyses are considered to have adequately addressed the static slope stability of the dam.

In order to compensate for residual settlement of the embankment and foundation materials upon completion of the dam, 2.7 feet of fill was added to the design crest at the maximum section. The additional height was determined by a settlement analysis utilizing the results of the

consolidation tests on the foundation and embankment materials. The analysis was apparently accurate since the dam crest appears level and uniform.

Design data for the internal seepage control system was limited to the details on the as-built drawings of the filter drain trenches, cutoff trench, and grouting program along the left side of the dam. Filter design was based upon the sandy weathered rock material and less weathered rock fill material which was anticipated by the designers to be excavated in the emergency spillway and placed as a pervious zone in the downstream slope. The filter design appears adequate. Although flow nets, derivation of exit gradients, seepage quantity estimates after partial grouting, and filter trench drainage capacities were not addressed in the design report, the grouting program and internal drainage system visually appear to be functioning satisfactorily.

2. Appurtenant Structures. Based upon the data in the design report, the appurtenant structures were designed in accordance with good engineering practice. The reinforced concrete elements were analysed for maximum loading conditions by the working stress method utilizing 3000 p.s.i. concrete and a steel stress of 20,000 k.s.i. The riser structure was designed utilizing concrete strengths of 3750 p.s.i. The foundation for the riser apparently consists of compacted fill. Based upon the structural computations, loads as high as 5100 p.s.f. are present at the foundation level. This load appears somewhat high for ordinary compacted fill, but the good visual condition of the structure suggests that sufficient soil strength has been mobilized to support the loading conditions to date.

c. Operating Procedures

Detailed operating procedures are unwritten and were unavailable for review. The Annual Operation and Maintenance Inspection sheets were reviewed and they did not reveal any major deficiencies which might affect the integrity of the dam.

d. Post Construction Changes

The only post construction change consists of loss of vegetative cover on the downstream slope at the left side of the dam due to recreation vehicle traffic. This cover should be reestablished before erosion takes place.

e. Seismic Stability

Lake Bernard Frank Dam is located in seismic zone 1 and seismic stability is predicated upon static stability with conventional margins of safety. The static stability is considered sufficient to withstand minor earthquake induced forces.

SECTION 7
ASSESSMENT, REMEDIAL MEASURES
AND RECOMMENDATIONS

7.1 Dam Assessment.

a. Safety. Based on visual inspection and review of design and construction documents, the dam at Upper Rock Creek Watershed Site #1 appears to presently be in good condition. The higher than normal pool elevation, as discussed in Sections 5.1.c. and 5.2.c. presents no immediate safety hazard but this condition should be rectified as soon as possible.

b. Adequacy of Information. The available information consists of as-built construction drawings, Engineer's Design Report and Engineer's Construction Report with test results. The available information is adequate to assess the condition.

c. Urgency. The recommendations should be implemented as soon as possible.

d. Necessity for Additional Studies. No additional engineering studies are necessary at this time. As remedial measures are developed to correct the deficiencies at the intake tower, engineering assistance may be necessary in attempting to prevent a reoccurrence.

7.2 Remedial Measures and Recommendations.

a. Dam and Appurtenant Structures

1. Re-establish the designed normal pool by clearing debris from the ungated orifices within the cold water release chamber.

2. Re-establish the operating condition of all gated orifices within the cold water release chamber and principal spillway riser.

b. Operation and Maintenance Procedures

1. Document operating procedures in writing.

2. Develop a warning system to warn downstream residents of large spillway discharges during periods of heavy rainfall and runoff or failure of the dam.

3. Re-establish vegetation on left side of downstream face of dam and on the berm separating the dam and emergency spillway.

4. Implement rodent control and refill existing burrows.

APPENDIX A

CHECK LIST - VISUAL INSPECTION, SITE SKETCH, PHASE I

Check List
Visual Inspection
Phase I

Name of Dam Upper Rock Creek Watershed Site #1 ID # MD 00050

Common Name of Dam / Lake Lake Bernard Frank

County Montgomery State Maryland

Type of Dam Earth Hazard Category 1

Date(s) of Inspection 6/15/79 Weather Clear / Sunny

/ / Temperature 85° F

Pool Elevation at Time of Inspection 306.5± MSL Tailwater 272.0± MSL

Normal Pool Elevation 298.0 MSL

Inspection Personnel:

Water Resources Administration	M.N.C.P.P.C.	U.S.D.A.-S.C.S.	Montg.S.C.D.
J. O. Smith	Jerry Bush	Richard Nagel	Bob Rakestraw
T. J. Moynahan	John M. Bower (Mac)	Larry Herrington	
J. M. Wagner		George Daelemans	
R. T. Folkman			
L. J. Arthurs			

Recorder T.J.Moynahan

A-1

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMMENDATIONS
SURFACE CRACKS	NONE
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Generally good condition, recreational vehicle traffic has worn a path on the downstream face of the dam near the left abutment, no erosion.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Uniform and stable.
RIPRAP FAILURES	Rip-rap submerged and non-observable.

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Well vegetated - stable
ANY NOTICEABLE SEEPAGE	NONE
STAFF GAGE AND RECORDER	NONE
DRAINS	Internal drain outfalls are clear of debris,floc,etc. Flow in the right drain is approximately 1-2 gpm. Flow in the left drain is approximately 10-15 gpm. All seepage is clear

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Outlet conduit surrounded by concrete outlet/plunge pool structure. The exposed portion of the conduit is in good condition.
INTAKE STRUCTURE	The concrete riser and metal appurtenances are in good condition. The drain and two gated intakes are inoperative. Both normal pool intakes (ungated) are clogged with debris resulting in pool elevations approximately 8.5 feet above normal pool. One other gated inlet is operable.
OUTLET STRUCTURE	The concrete retaining walls of the outlet/plunge pool structure are in good condition.
OUTLET CHANNEL	Outlet channel is lined with rip-rap, natural boulders, and vegetation. The channel is stable. Rip-rap accumulated at the end of the plunge pool has raised the pool level to the bottom of the drain pipe. This rip-rap accumulation should be removed to lower the pool level.
EMERGENCY GATE (DRAIN)	The emergency gate cable is broken.

VISUAL INSPECTION
PHASE I
EMERGENCY UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMMENDATIONS
CONCRETE WEIR	N/A
APPROACH CHANNEL	Short grass and clear.
DISCHARGE CHANNEL	Short grass and clear.
BRIDGE AND PIERS	N/A

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE
OBSERVATION WELLS	NONE
WEIRS	NONE
PIEZOMETERS	NONE

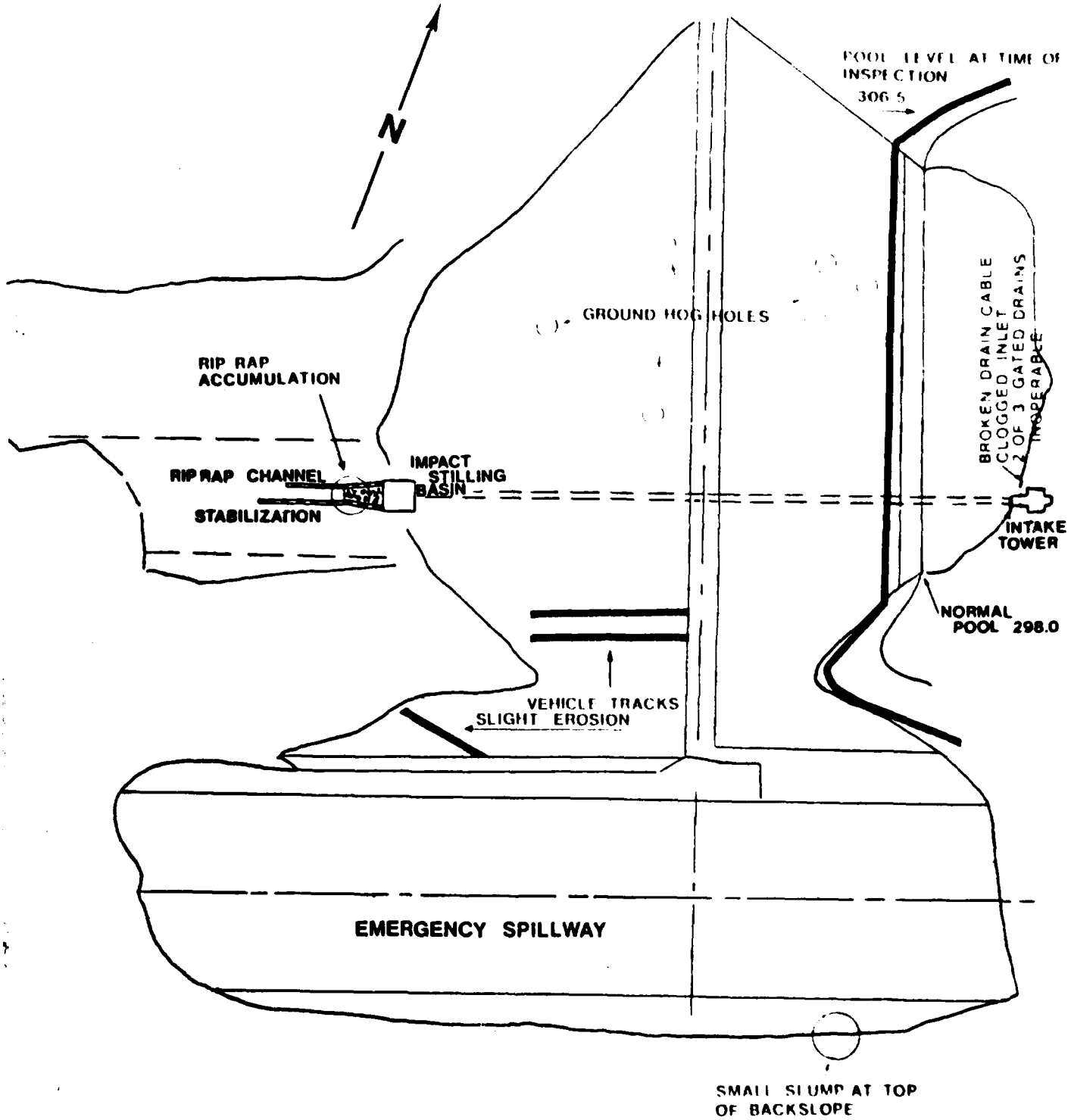
VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMMENDATIONS
SLOPES	Reservoir slopes are primarily wooded with some meadow land. Slight erosion exists around the present pool edge due to foot traffic.
SEDIMENTATION	Sedimentation is reported in the headwaters of the pool.

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS/RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Downstream channel is clear of obstructions. Heavy woods may result in an occassional downed tree in the channel. A USGS stream guage is located 500 feet beyond the downstream toe.
SLOPES	Heavliy wooded and stable.
APPROXIMATE NUMBER OF HOMES AND POPULATION	There is heavy recreational use of Rock Creek Park downstream. Md. Rte. 28 is downstream. No homes are apparent in the immediate danger reach.
	Wholly owned on land belonging to M.N.C.P.P.C.

FIELD SKETCH
UPPER ROCK CREEK SITE NO. 1
LAKE FRANK



APPENDIX B

CHECK LIST - ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION,

PHASE I

DAM NAME: Upper Rock Creek Site #1
COMMON NAME: Lake Bernard Frank
ID #: MD 00050

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Wooded stream valleys, farming and new home development. SCS design Runoff Curve Number 82.

ELEVATION TOP OF NORMAL POOL(STORAGE CAPACITY): 298.0 (785)

ELEV. TOP OF FLOOD CONTROL POOL(STORAGE CAPACITY): 334.5(4679)

ELEVATION MAXIMUM DESIGN POOL: 338.7(5544)

ELEVATION TOP OF DAM: 347.9

CREST-Principal Spillway Riser

a. Elevation 314.5(crest) 317.0 (top slab)
b. Type Reinforced Concrete Riser
c. Width Two 10.5 ft. long crests
d. Number and Type of Gates Three 24" diameter Rodney Hunt 280 Series Sluice Gates, one at 290.33, one at 281.42, both for cold water release; one at 273.0 for drain. One 2 ft. x 3.5 ft. wide sluice gate at elev. 272.5 for drain.
e. Ungated Orifice Twin 2 ft. x 3 ft. wide openings at elev. 298.0 for normal releases.

CREST- Emergency Spillway (Earth Cut)

a. Elevation 334.5
b. Width 150 feet
c. Length 656 feet
d. Location beyond left abutment

OUTLET WORKS:

a. Type 42" R.C.Pipe
b. Location station 4+47 (left of center of dam)
c. Entrance Inverts 272.5
d. Exit Inverts 270.21
e. Emergency Drawdown Facilities
f. Length 458 feet

HYDROMETEOROLOGICAL GAGES:

	Daily	Hourly
a. Type	NOAA-NWS	NOAA-NWS
b. Location	Rockville 3 NE	College Park
c. Records	32 yrs. of record	93 yrs. of record

ITEM	REMARKS	
	EMERGENCY	PRINCIPAL
SPILLWAY PLAN	Refer to plan sheet 3 for layout	Refer to plan sheet 3 for layout
SECTIONS	Refer to plan sheet 7 for profile	Refer to plan sheet 8 for profile
DETAILS	N/A	Refer to plan sheet 9,10,11,12, for structural details.
OPERATING EQUIPMENT PLANS & DETAILS		Refer to plan sheet 9 for gate location & nomenclature.

ITEM	REMARKS
MONITORING SYSTEMS	None installed
MODIFICATION	1-Winch operated slide gate for bottom orifice of cold water mixing chamber designed by College Park office of SCS, plan sheet dated 8/16/67.
HIGH POOL RECORDS	Not recorded
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	Annual Operation & Maintenance Inspection Report by SCS dated 12/2/76.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION, REPORTS-	None Verbal report of high water during Hurricane Agnes.

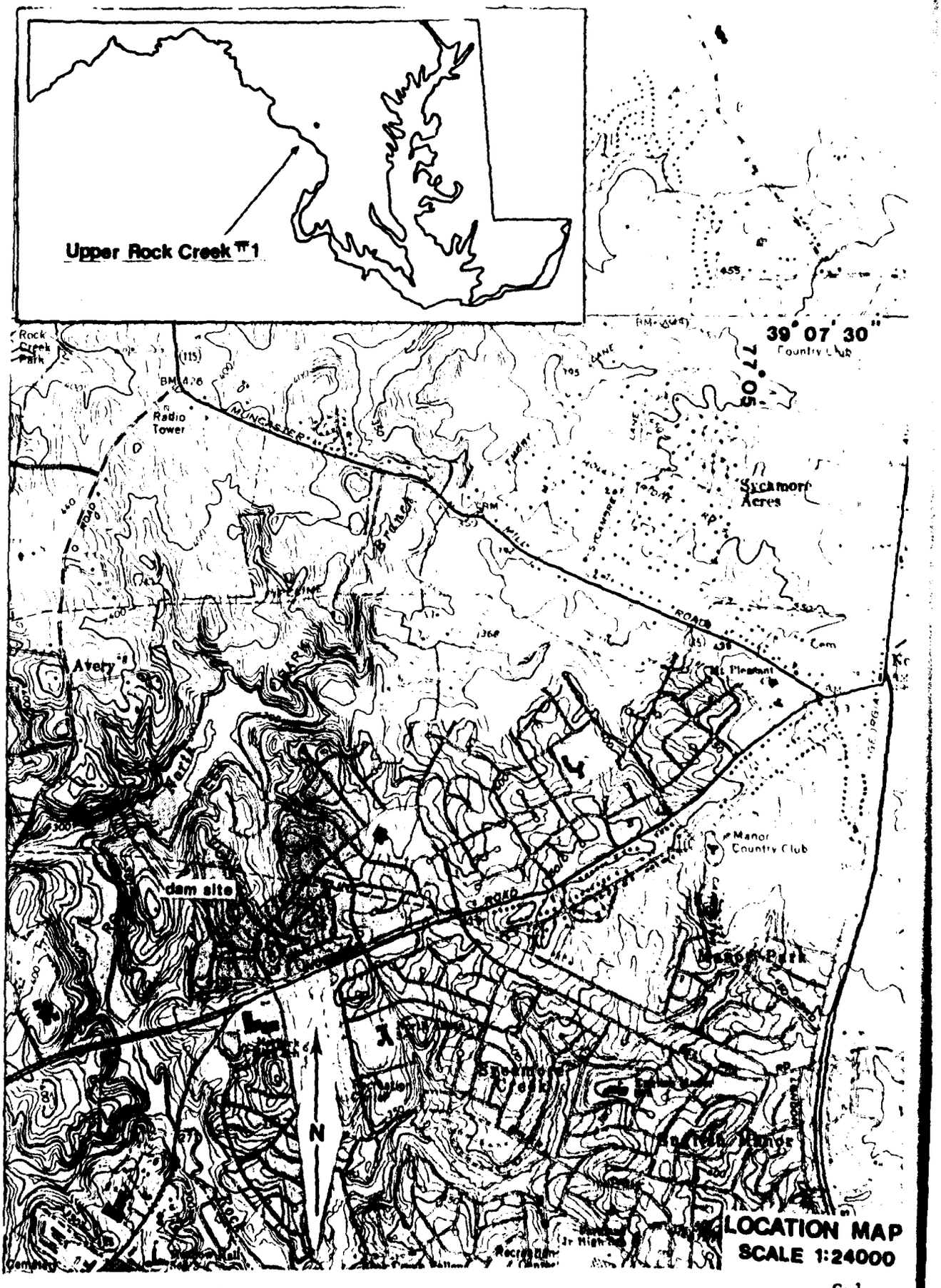
ITEM	REMARKS
MAINTENANCE OPERATION RECORDS	No written history of maintenance performed, see annual O&M reports for deficiencies/remedial measures recommended.
MISC.	Water Resources Construction Permit 69-OB-0001 dated May 18, 1965.
DESIGN REPORTS	Design Report for Upper Rock Creek Watershed Site No. 1 Dated March, 1965 by USDA-SCS Upper Darby, Pa.
GEOLOGY	Included in Design Report as Section IV A.
DESIGN COMPUTATIONS	Included in Design Report
HYDROLOGY & HYDRAULICS	Included in Design Report as Section III
DAM STABILITY	Included in Design Report as Section IV A
SEEPAGE STUDIES	Included in Design Report as Section IV B

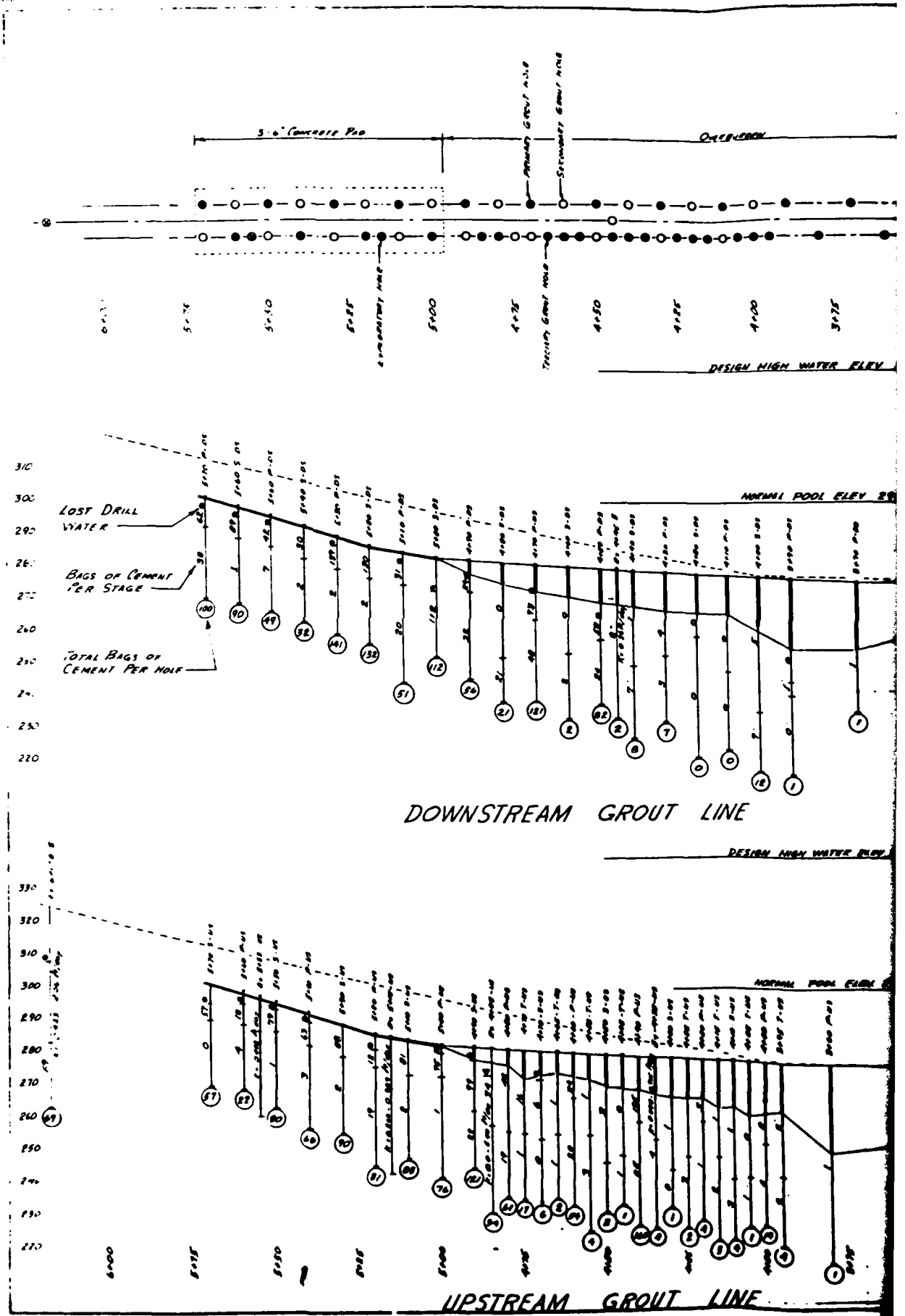
ITEM	REMARKS
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Included in Design Report as Section IV B For borings see plan sheets 18-28 Included in Design Report as Section IV B See Engineer Report on Construction dated March 15, 1968 for concrete, compaction and material results.
POST CONSTRUCTION SURVEY OF DAM	See as-built drawings
BORROW SOURCES	See plan sheets 15 and 16.
AS BUILT DRAWINGS	Available
REGIONAL VICINITY MAP	Available

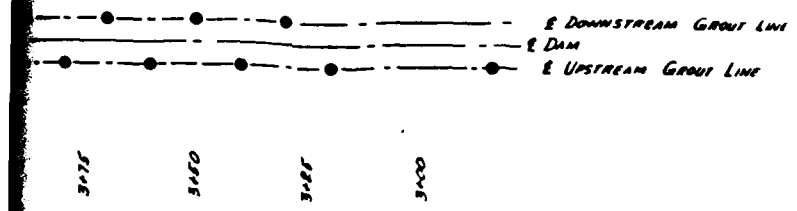
ITEM	REMARKS
CONSTRUCTION HISTORY	See Engineering Report on Construction dated March 15, 1968
TYPICAL SECTIONS OF DAM	See as-built drawings
OUTLETS-PLANS -DETAILS -CONSTRAINTS -DISCHARGE RATINGS	See as-built drawings See as-built drawings See Design Report Section III, Sheet 23
RAINFALL/RESERVOIR RECORDS	Daily rainfall records obtained by owner for National Weather Service in vicinity of Regional Park; no pool records maintained.

APPENDIX C

LOCATION MAP & PLANS

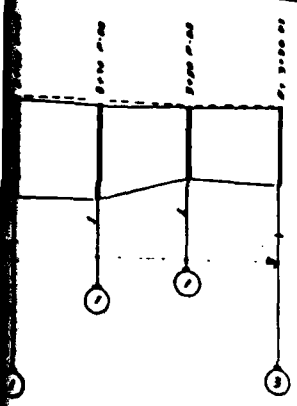

Upper Rock Creek T1
39° 07' 30"
77° 05'
Rock Creek Park
Radio Tower
Sycamore Acres
Avery
dam site
Manor Country Club
N
LOCATION MAP
SCALE 1:24000


5'-0" Concrete Pad
Overburden
Design High Water Elev
Normal Pool Elev
Lost Drill Water
Bags of Cement Per Stage
Total Bags of Cement Per Hole
DOWNSTREAM GROUT LINE
UPSTREAM GROUT LINE



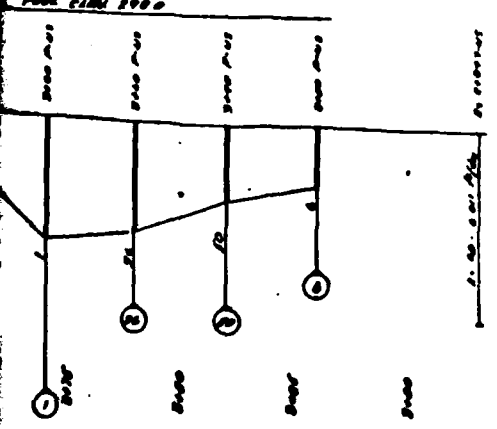
WATER ELEV 9307

POOL ELEV 2980



WATER ELEV 9307

POOL ELEV 2980



AS BUILT

See Sheet 5 of 28, Construction Plans

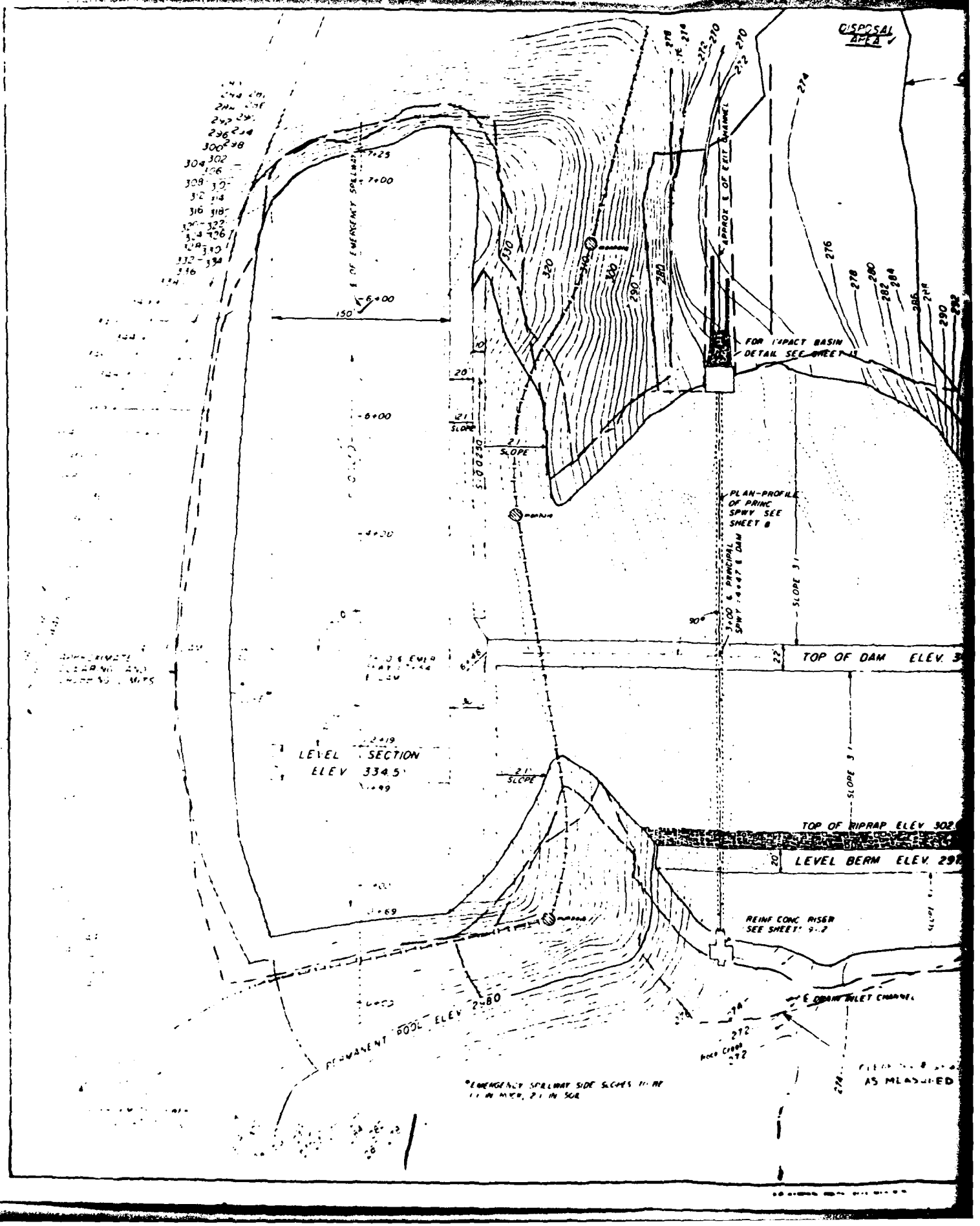
GROUTING
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO 1

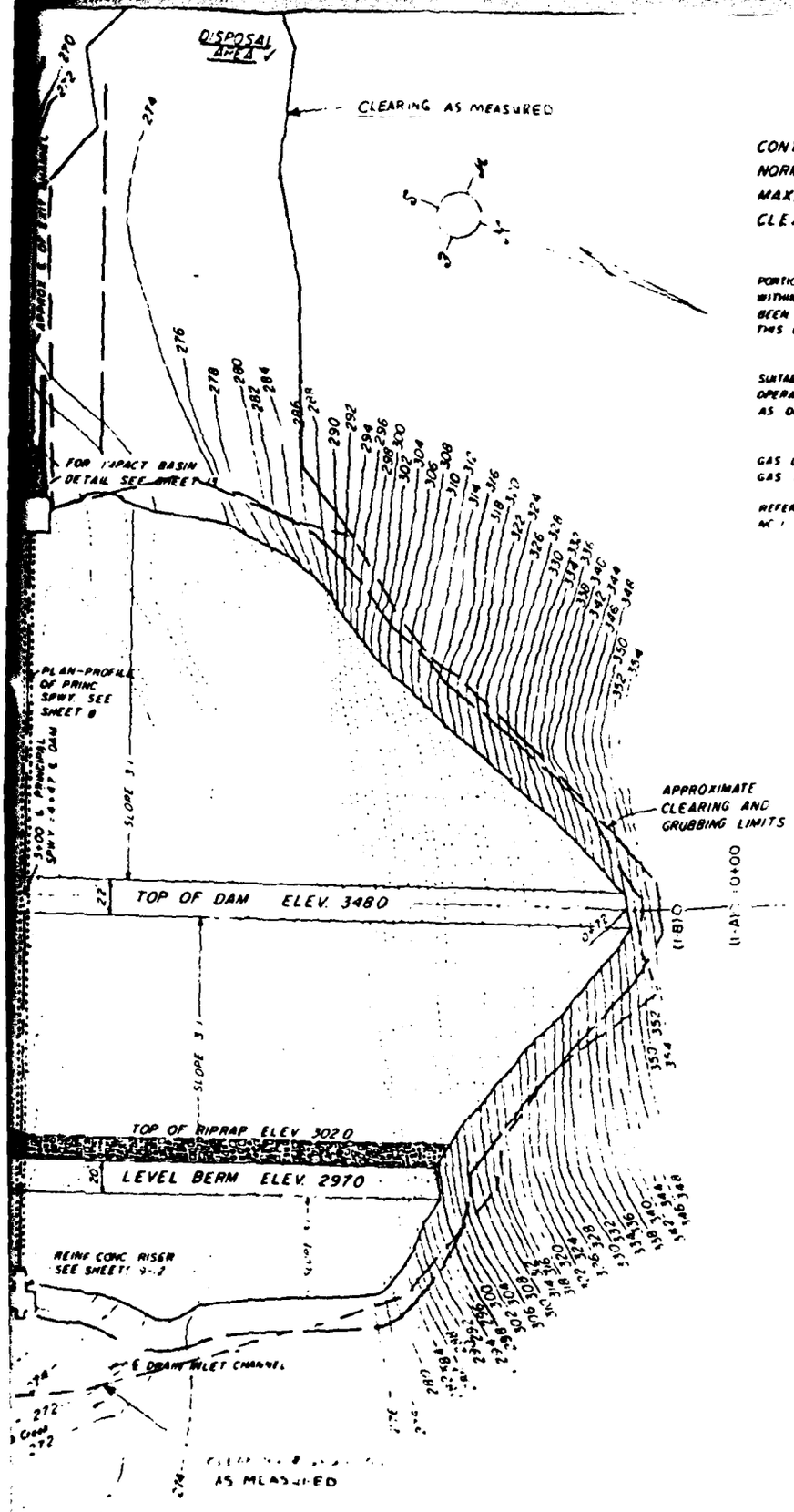
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

J V DeGroot
J C Cotton 5/66
J V DeGroot
E L Mensch

MD 442-P

C-2


DISPOSAL AREA
APPROX E OF EXIT CHANNEL
FOR IMPACT BASIN DETAIL SEE SHEET
PLAN-PROFILE OF PRINC SPWY SEE SHEET 8
E OF EMERGENCY SPILLWAY
7+25
7+00
6+00
150'
20'
10'
2:1 SLOPE
5.00 % PRINCIPAL SPWY
90°
SLOPE 3:1
TOP OF DAM ELEV. 3
LEVEL SECTION ELEV 334.5'
TOP OF RIPRAP ELEV 302
LEVEL BERM ELEV. 29
REINF CONC RISER SEE SHEET
E OF OUTLET CHANNEL
PERMANENT POOL ELEV 280
AS MEASURED
*EMERGENCY SPILLWAY SIDE SLOPES 11 IN
11 IN MCD, 2:1 IN SOIL



LEGEND

CONTOUR LINES _____ 320

NORMAL POOL (ELEV. 2980) _____

MAX. HIGH WATER (ELEV. 3387) _____

CLEARING & GRUBBING LIMITS _____

NOTES

PORTIONS OF THE WSSC SEWER MAIN AS SHOWN ON THESE DRAWINGS WITHIN THE LIMITS OF THE EMBANKMENT OF THIS STRUCTURE HAVE BEEN PREVIOUSLY INSTALLED AND ARE OUTSIDE THE SCOPE OF THIS CONTRACT

SUITABLE TOPSOIL REMOVED AND STOCKPILED DURING STRIPPING OPERATIONS SHALL BE PLACED ON THE DAM AND EMERGENCY SPILLWAY AS DIRECTED BY THE ENGINEER

GAS LINE NOTE - EXISTING 22" GAS LINE PROPERTY OF WASHINGTON GAS LIGHT COMPANY

REFER TO SHEET 15 FOR GAS LINE CROSSING ACCESS TO BORROW AREA NO 1

AS BUILT

PLAN OF DAM SITE
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO 1

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MD 442-P

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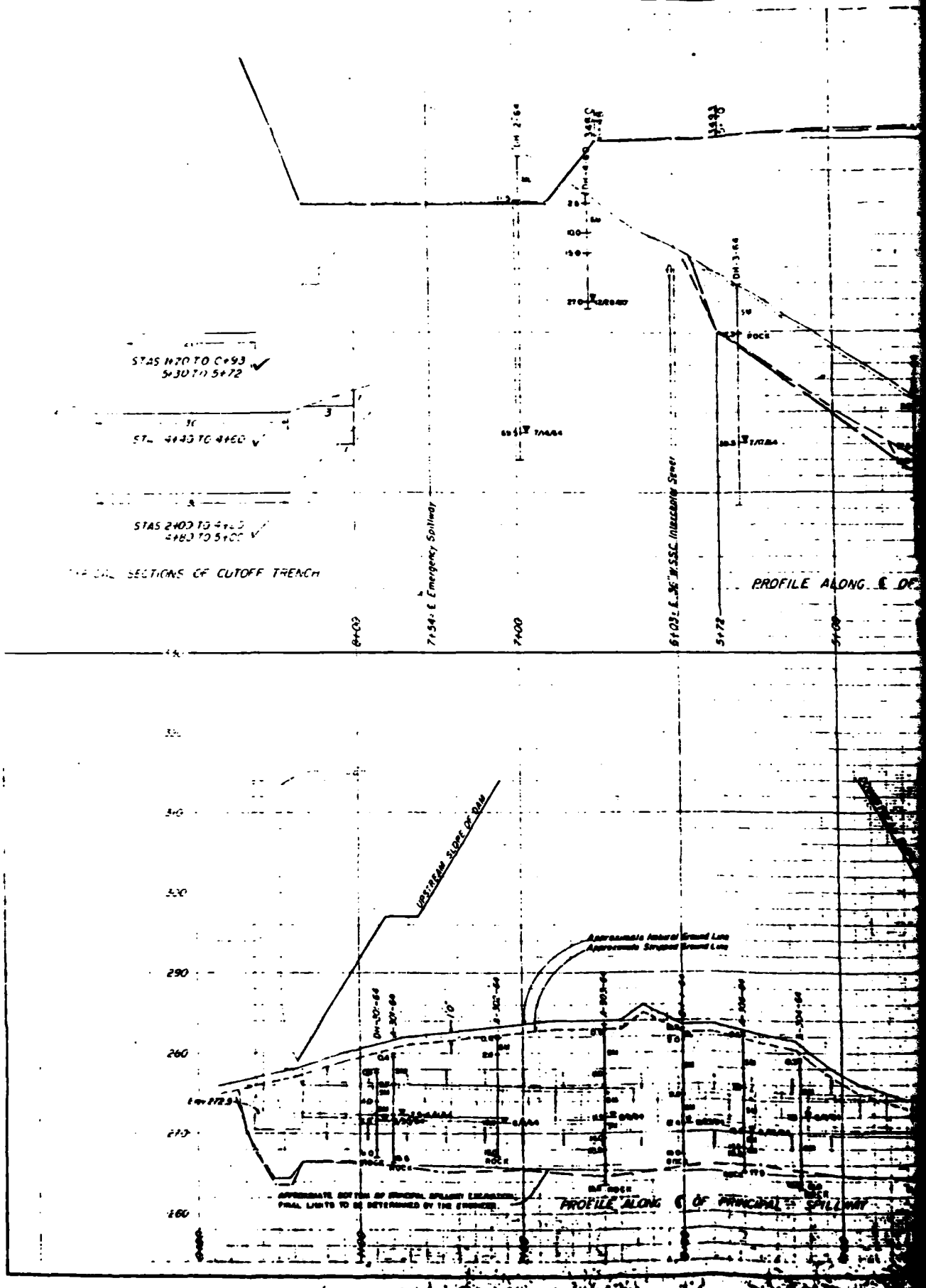
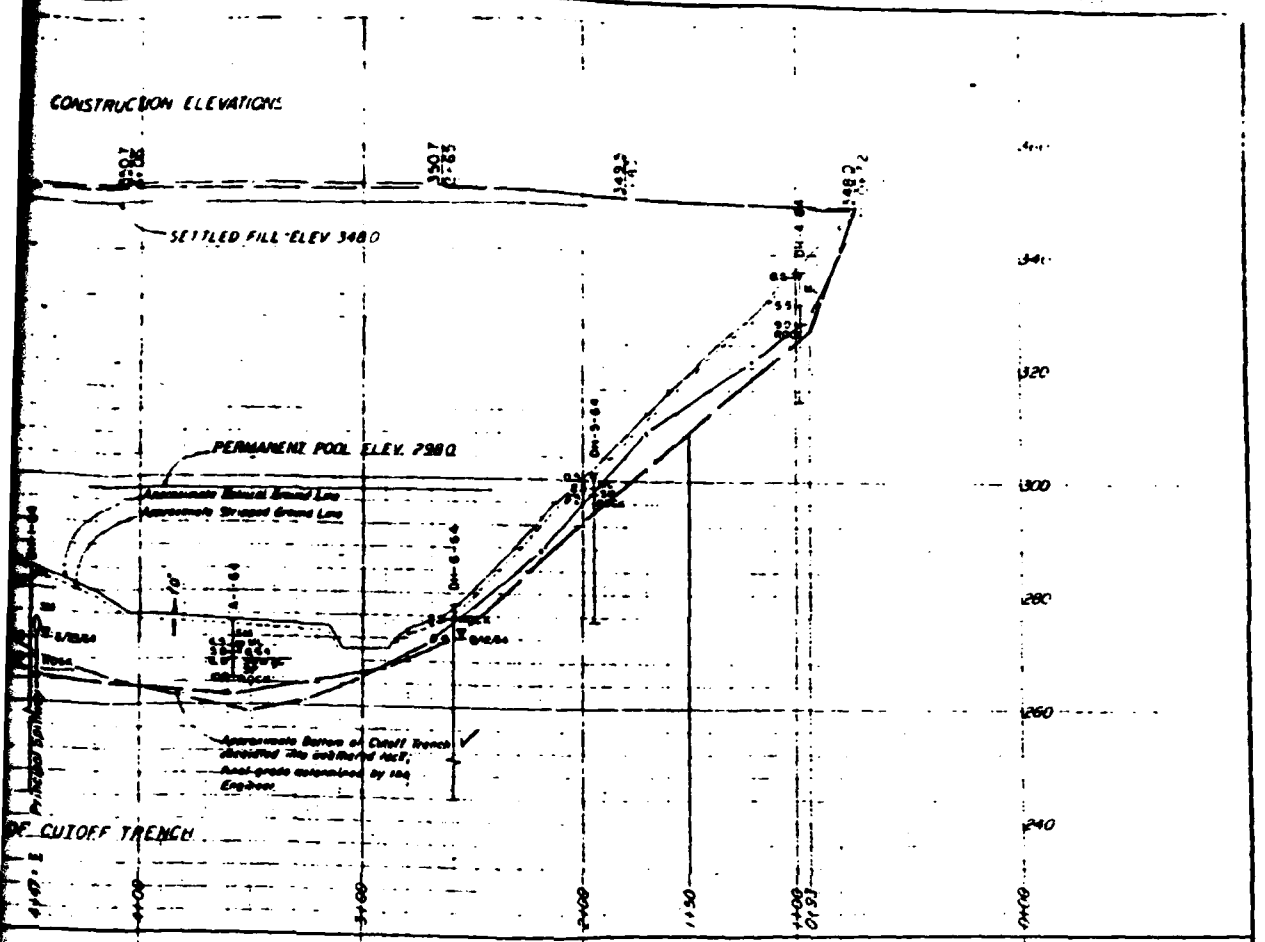
C-3


STAS 1+70 TO 0+93
5+30 TO 5+72
STA 4+43 TO 4+60
STAS 2+40 TO 4+43
4+83 TO 5+00
TYPICAL SECTIONS OF CUTOFF TRENCH
PROFILE ALONG ℄ OF
7+54± ℄ Emergency Spillway
6+03± ℄ W.S.S.C. Interceptor Sewer
UPSTREAM SLOPE OF DAM
Approximate Natural Ground Line
Approximate Stripped Ground Line
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY



PROFILES-PRIN. SPWY. & CUTOFF TRENCH
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO. 1

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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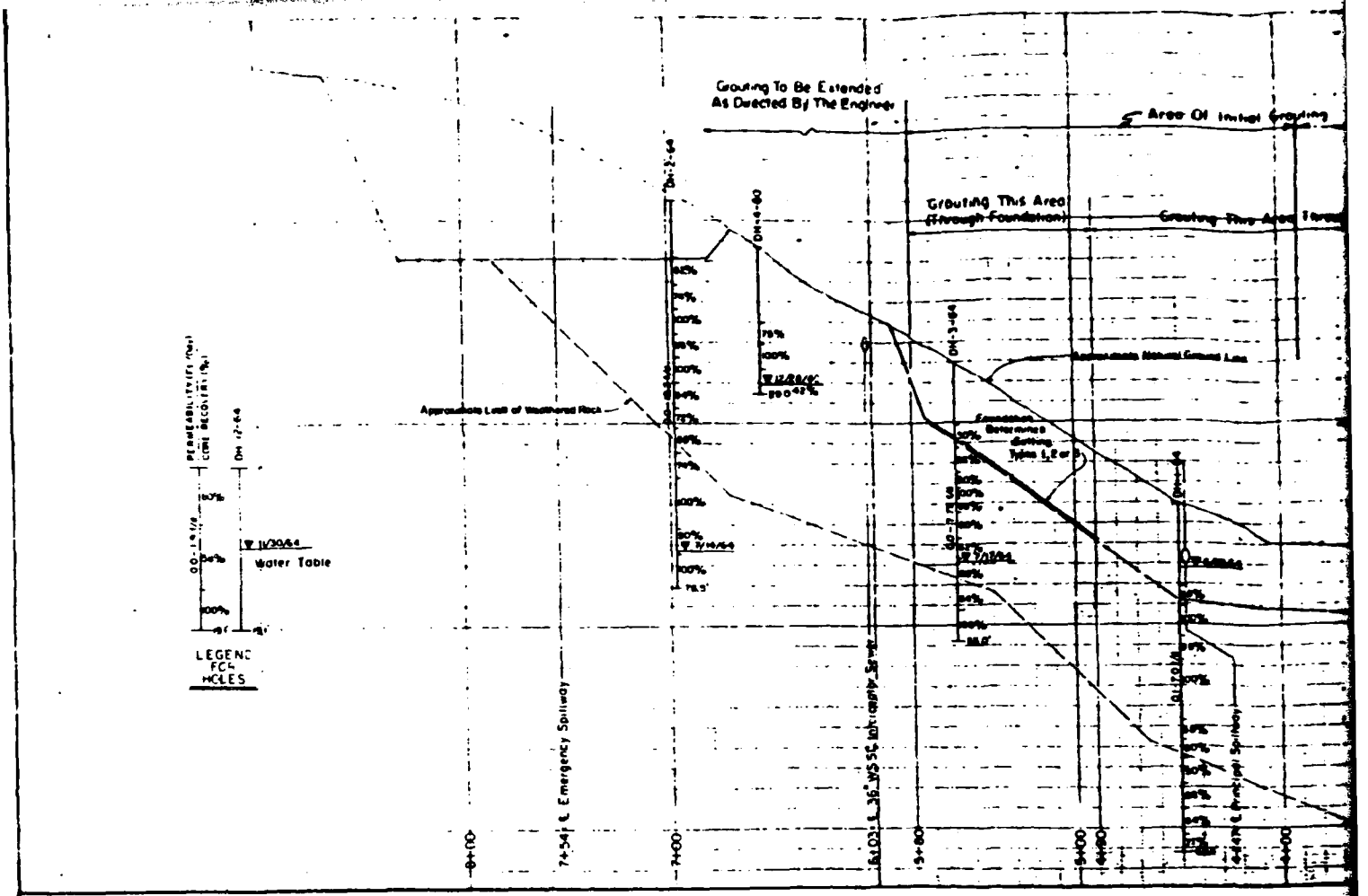
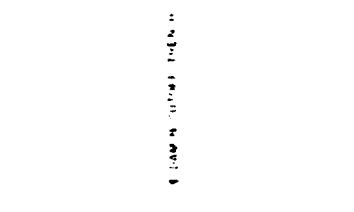
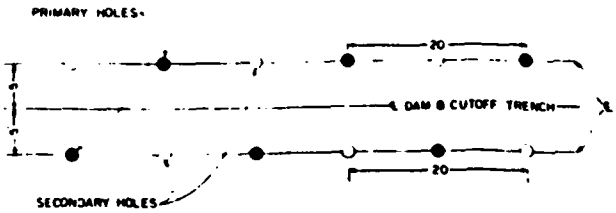
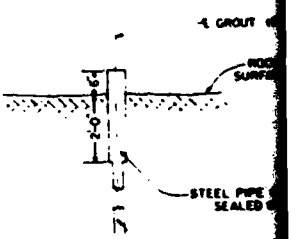




TYPICAL SECTION OF GROUT CURTAIN



TYPICAL GROUT HOLE PATTERN
NOT TO SCALE



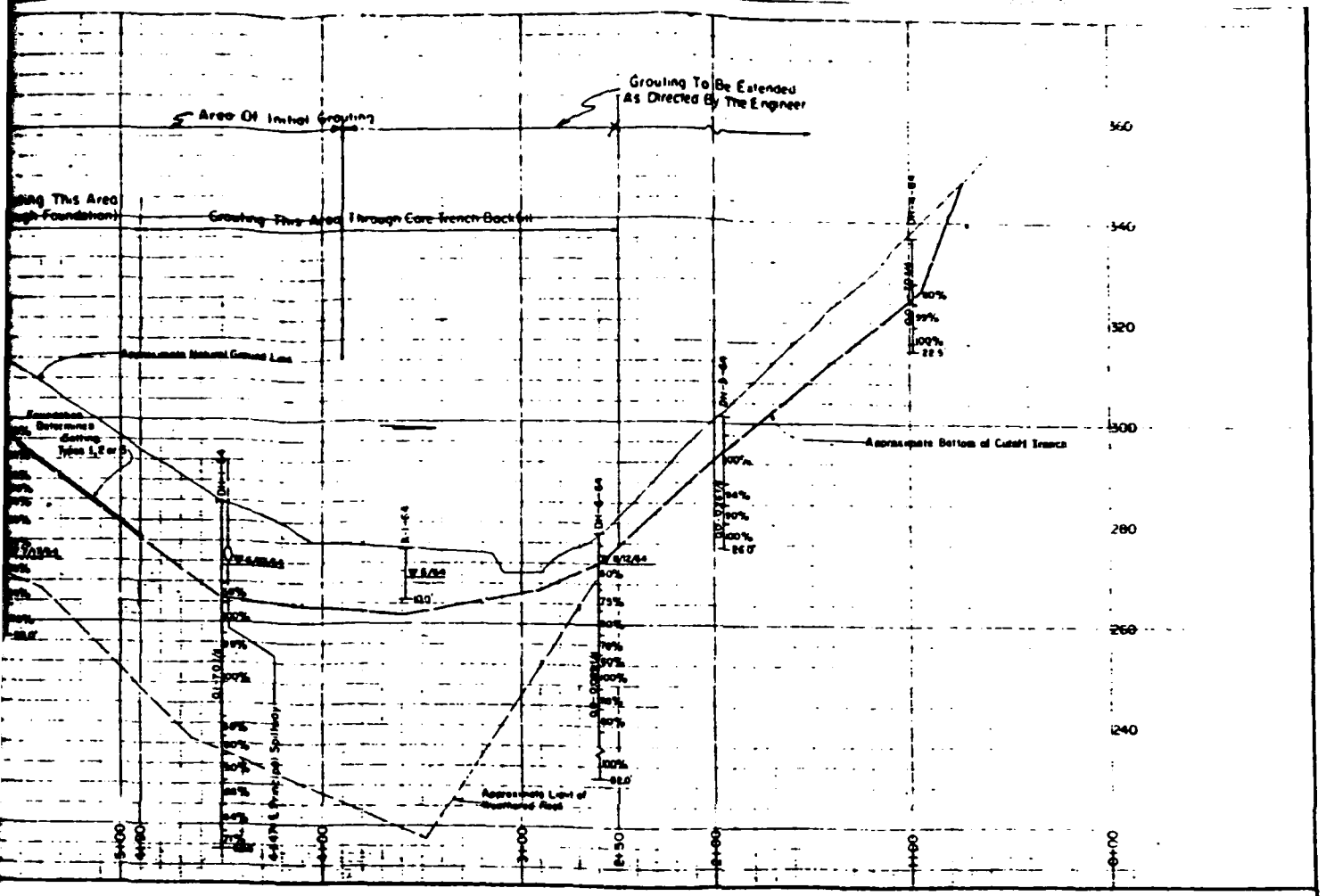
TYPE 1

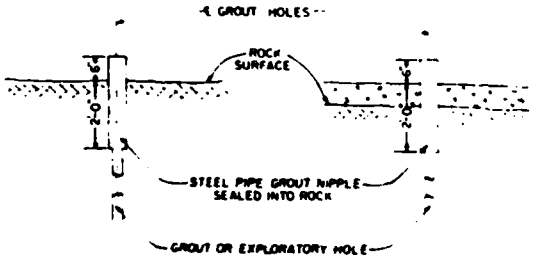
TYPICAL

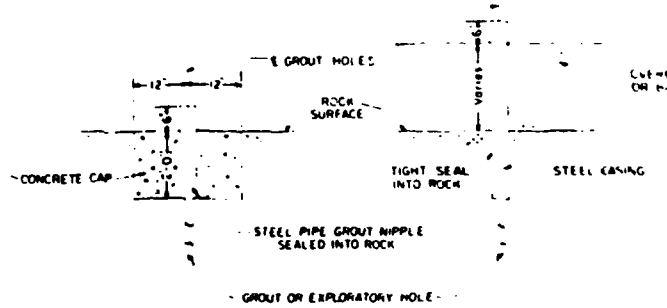
NOTES

1 SETTING TYPES
ABOVE, SHALL
DIRECTED BY

2 DRILLING IS
PROCEED







GROUT HOLES

TYPE 1
Not Used

TYPE 2 ✓

TYPE 3
Not Used

TYPE 4 ✓

TYPICAL NIPPLE OR CASING SETTING FOR GROUT OR EXPLORATORY HOLES

NOT TO SCALE

NOTES

1. SETTING TYPES 1, 2 OR 3 FOR GROUT NIPPLES OR TYPE 4 FOR STEEL CASINGS, (SHOWN ABOVE), SHALL BE USED AS DETERMINED BY ROCK CONDITIONS ENCOUNTERED AND AS DIRECTED BY THE ENGINEER.
2. GROUTING IS PRIMARILY REQUIRED IN THE LEFT ABUTMENT, HOWEVER, GROUTING SHALL PROCEED TOWARD THE RIGHT ABUTMENT UNTIL TIGHT ROCK IS ENCOUNTERED.

For Detailed information See "Grouting" Sheet 1 of 1

AS BUILT

FOUNDATION GROUTING DETAILS
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO. 1

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MD 442-P

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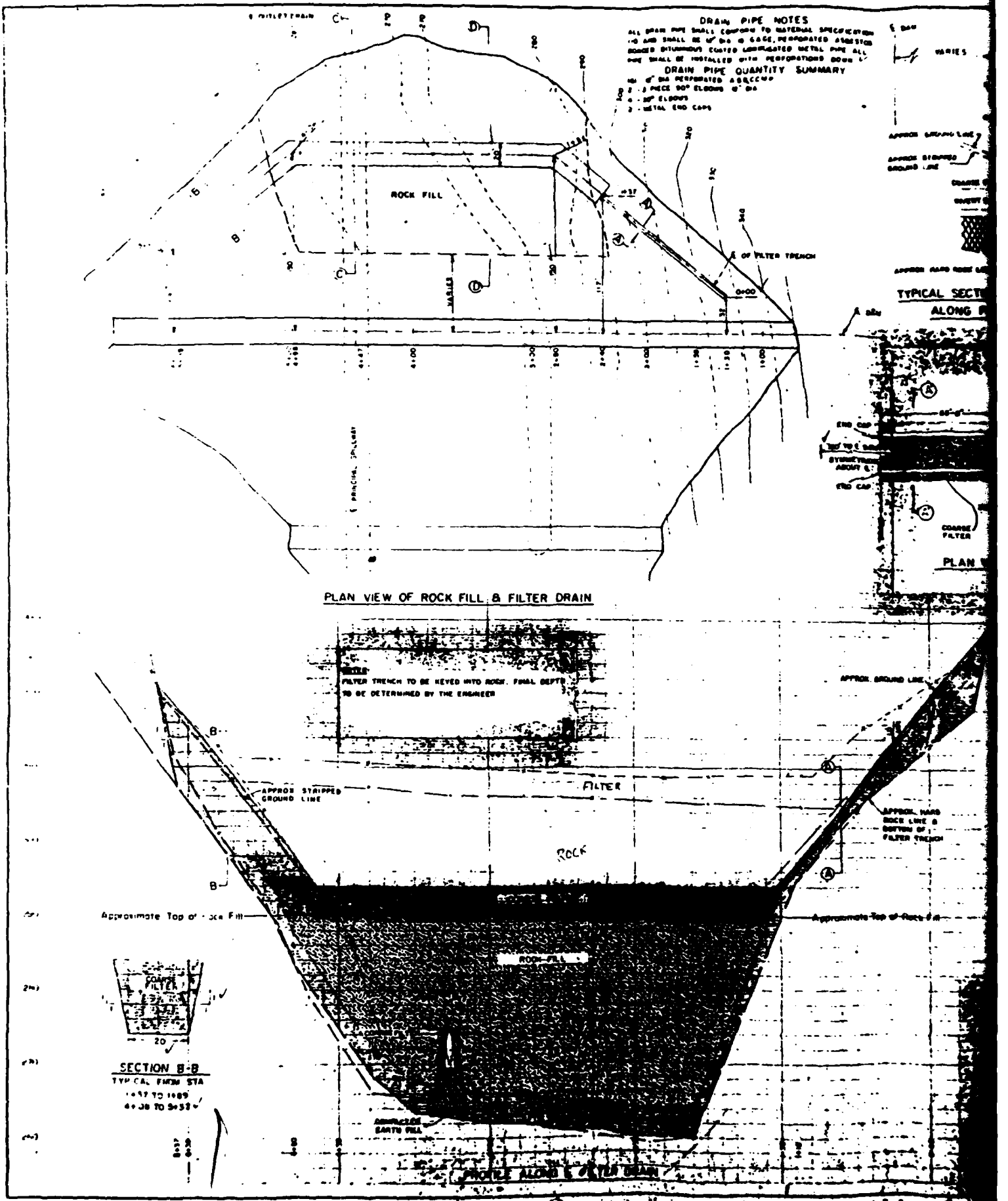
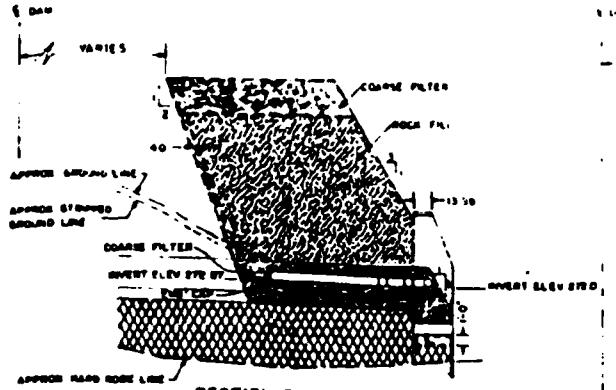
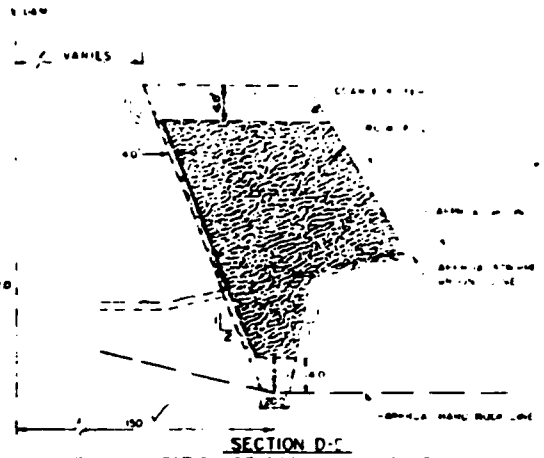
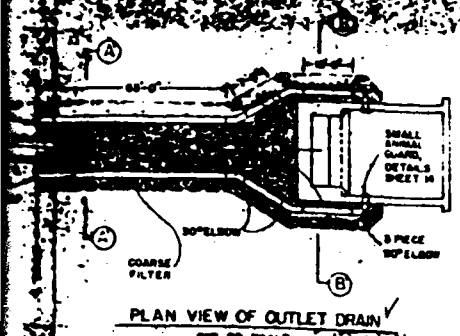

DRAIN PIPE NOTES
DRAIN PIPE QUANTITY SUMMARY
ROCK FILL
PLAN VIEW OF ROCK FILL & FILTER DRAIN
FILTER TRENCH TO BE KEYED INTO ROCK. FINAL DEPTH TO BE DETERMINED BY THE ENGINEER
APPROX STRIPPED GROUND LINE
FILTER
ROCK
ROCK FILL
SECTION B-B
TYPICAL FROM STA



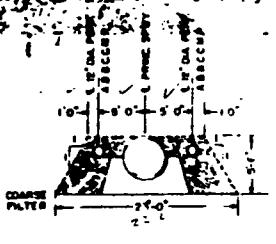
SECTION C-C
TYPICAL SECTION OF ROCK FILL & FILTER DRAIN
ALONG PRINCIPAL SPILLWAY CONDUIT



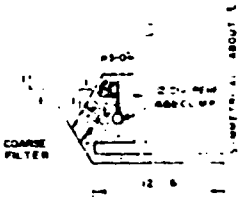
SECTION D-D
TYPICAL SECTION OF ROCK FILL & FILTER DRAIN
ADJACENT TO PRINCIPAL SPILLWAY CONDUIT
NOT TO SCALE



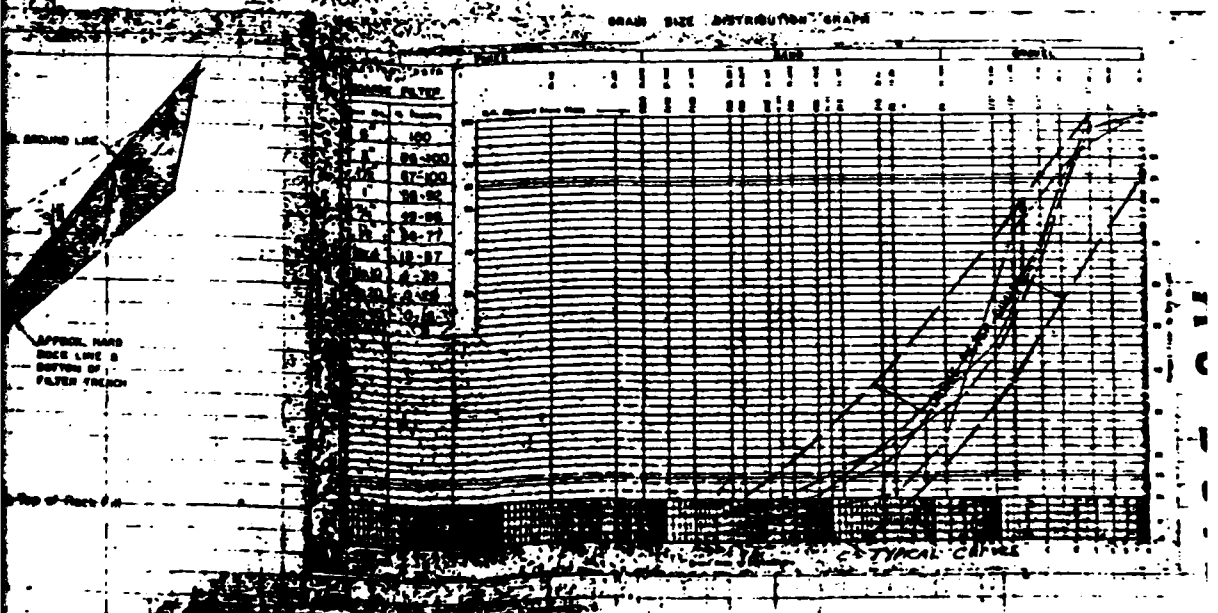
PLAN VIEW OF OUTLET DRAIN

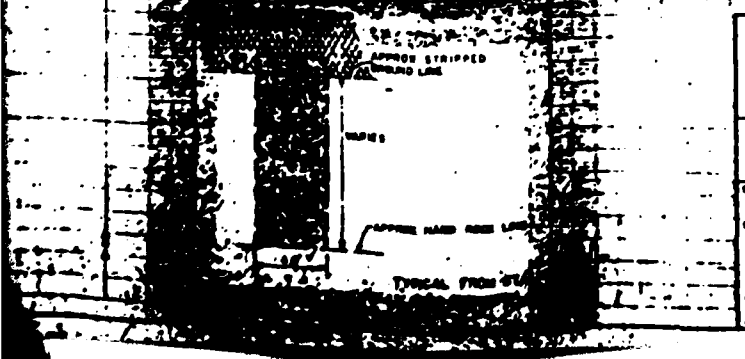


SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE





ROCK FILL & FILTER DRAIN DETAILS
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO 1

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

C-6

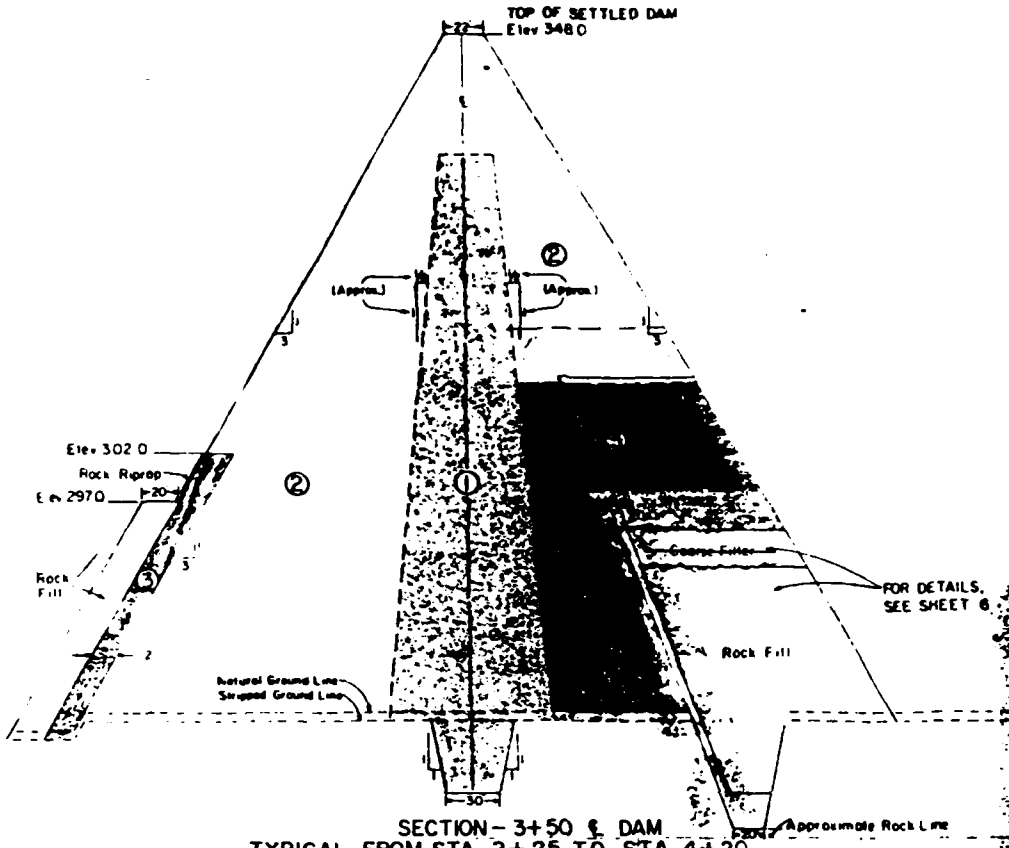
MD. 442-P

NOTE-ALL EARTH FILL WILL BE (
FILL (SEE CONSTRUCTION SPECIFICA
FILL WILL BE PERFORMED USING S
MINIMUM CONTACT PRESSURE OF

SECTION ① - COMPAC
"ML"- MO
REPRESENTED BY
A - 106
TP - 132
TP - 133
A - 107
TP - 134

SECTION ② - COMPAC
"ML" (PI
REPRESENTED BY
TP - 108
TP - 117
TP - 130
TP - 109
TP - 204

SECTION ③ - COMPAC
"SM"- NO
REPRESENTED BY
TP - 204



SECTION - 3+50 ℄ DAM
TYPICAL FROM STA. 2+25 TO STA. 4+20
AND FROM STA. 4+80 TO STA. 5+00

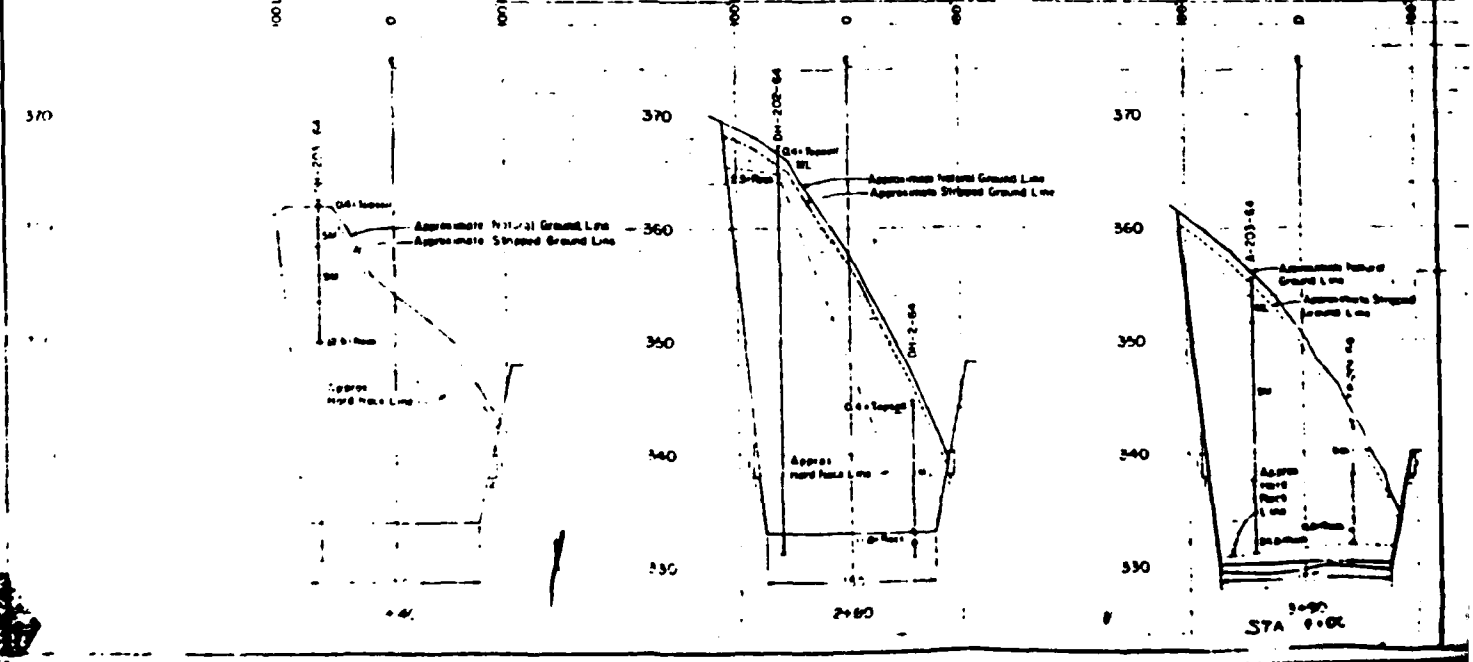
NOTES

1 THE BOUNDARIES OF SECTIONS
BOUNDARIES WILL BE DETERM

2 COMPACTED EARTH FILL WILL
SECTION ① & ②
-1 TO +3 PER
FOR THE MA
SECTION ③
-1 TO +3 PE
FOR THE

TYPICAL AS PROPOSED APPROXIMATE
FILL IN CONSTRUCTION

TYPICAL SECTIONS OF EMERGENCY SPILLWAY EXCAVATION

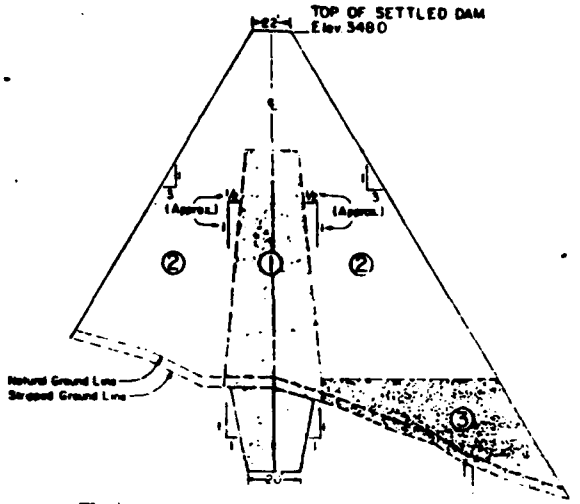


WILL BE COMPACTED CLASS B-2 OR ROCK
SPECIFICATIONS) COMPACTION OF EARTH
ED USING SHEEPSFOOT ROLLERS HAVING A
SURE OF 200 P.S.I.

① – COMPACTED FILL – CLASS B ?
"ML" – MOST PLASTIC (PI: 6-11)
ED BY
A - 106 f - 25'
TP-132 f - 14'
TP-133 f - 12'
A - 107 f - 14.5'
TP-134 f - 4'

② – COMPACTED FILL – CLASS B-?
"ML" (PI: 0-5)
ED BY
TP-108 f - 10'
TP-117 7' - 12'
TP-130 12' - 13.5'
TP-109 0.8' - 6.8'
TP-204 f - 4.6'

③ – COMPACTED FILL – CLASS B-2
"SM" – NON-PLASTIC
ED BY
TP-204 6.6' - 11.6'



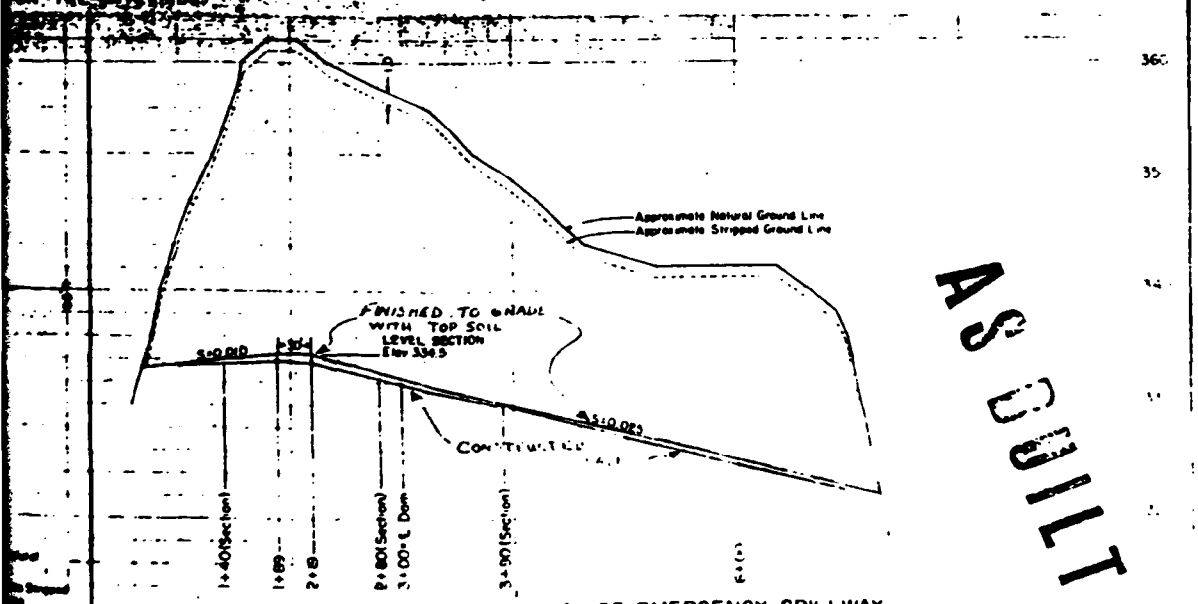
COARSEST MATERIAL TO BE PLACED ADJACENT TO CONCRETE FILTER MATERIAL AS DIRECTED BY TP-117 4' - 3'

Coarse Filter
Approximate Rock Line

SECTION – 2+00 ℄ DAM

S OF SECTIONS OF EMBANKMENT ARE APPROXIMATE AND THE ACTUAL
L BE DETERMINED BY THE ENGINEER DURING CONSTRUCTION

TH FILL WILL BE PLACED WITHIN THE FOLLOWING LIMITS OF MOISTURE CONTENT
① & ?
TO +3 PERCENT OF OPTIMUM MOISTURE AT THE SPECIFIED DENSITY
OR THE MATERIALS
③
TO +5 PERCENT OF OPTIMUM MOISTURE AT THE SPECIFIED DENSITY
THE MATERIAL



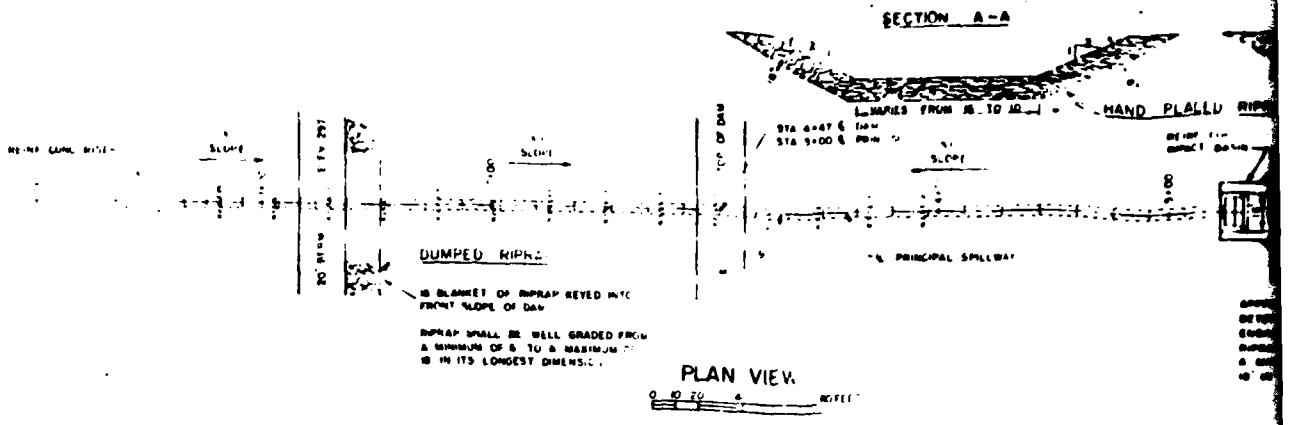
AS BUILT

PROFILE ALONG ℄ OF EMERGENCY SPILLWAY

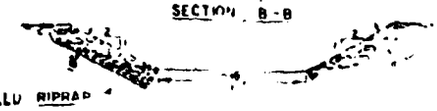
SECTIONS & PROFILE
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE 1.
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

For descriptions of Logs, see sheets 18 - 28

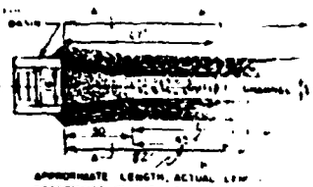
MD 44. C-7


SECTION A-A
DUMPED RIPRAP
PLAN VIEW
PROFILE ALONG ℄ PRINCIPAL SPILLWAY

SECTION B-B



PLACED RIPRAP



APPROXIMATE LENGTH, ACTUAL LENG
DETERMINED IN THE FIELD BY
ENGINEE
RIPRAP SHALL BE WELL GRADED FR
A MINIMUM OF 6 TO A MAXIMUM
40 IN ITS LONGEST DIMENSI

JOINT	DISTANCE FROM RISER WALL	INVERT ELEV. OF 42 DIA PIPE	SLOPE	AS BUILT INVERT	JT. GAP MIN-MAX
J-1	0	272.5		272.50	0 - ¼
J-2	10.33	272.47		272.46	0 - ¼
J-3	26.33	272.4		272.40	0 - ½
J-4	42.33	272.34		272.35	0 - ¼
J-5	58.33	272.29		272.29	0 - ¼
J-6	74.33	272.24		272.24	0 - ¼
J-7	90.33	272.18		272.18	¼ - ¼
J-8	106.33	272.1		272.10	0 - ½
J-9	122.33	272.04		272.04	0 - ½
J-10	138.33	271.98		271.98	0 - ¼
J-11	154.33	271.93		271.94	0 - ¼
J-12	170.33	271.8		271.87	¼ - ¼
J-13	186.33	271.8		271.81	0 - ¼
J-14	202.33	271.7		271.75	¼ - ½
J-15	218.3	271.6		271.67	0 - ½
J-16	234.33	271.6		271.64	0 - ¼
J-17	250.33	271.5		271.52	0 - ¼
J-18	266.33	271.4		271.42	0 - ¼
J-19	282.33	271.3		271.33	¼ - ½
J-20	298.3	271.2		271.22	0 - ¼
J-21	314.3	271.1		271.11	0 - ½
J-22	330.33	271.0		271.01	0 - ½
J-23	346.33	270.9		270.94	0 - ¼
J-24	362.3	270.8		270.81	0 - ¼
J-25	378.3	270.7		270.71	¼ - ½
J-26	394.3	270.6		270.61	0 - ¼
J-27	410.3	270.5		270.51	0 - ¼
J-28	426.3	270.4		270.41	0 - ¼
J-29	442.3	270.3		270.31	0 - ¼
J-30	458.3	270.2		270.21	0 - ¼

AS BUILT

PLAN-PROFILE OF PRINCIPAL SPILLWAY
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM NO. 2

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

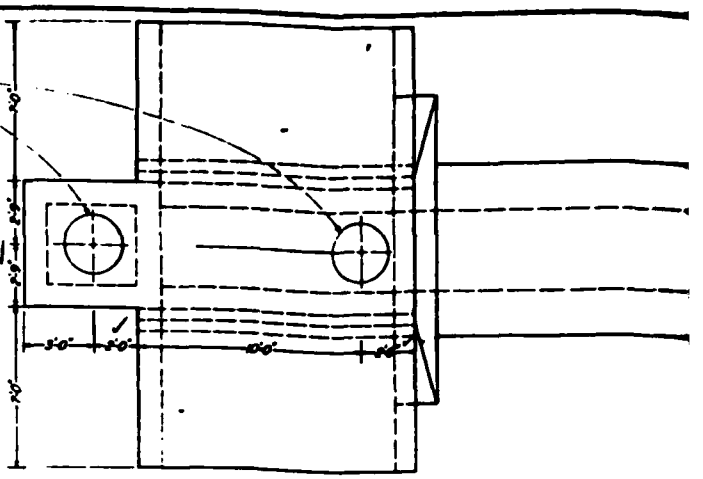
C-8

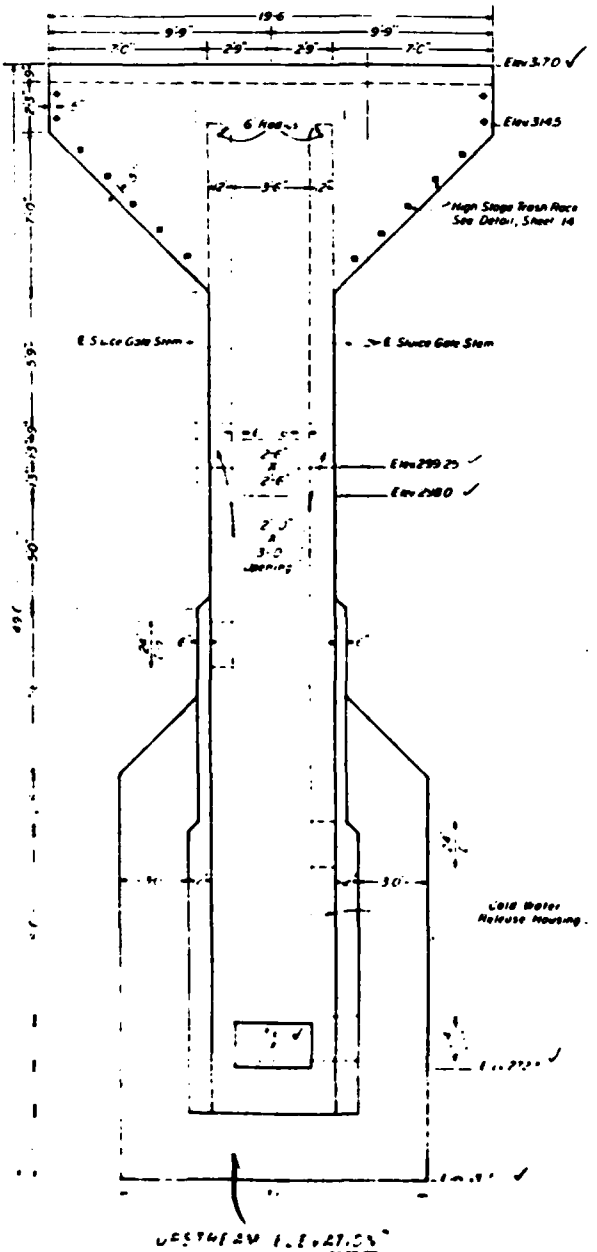
30" DIAMETER MANHOLE ASSEMBLY - NEENAH FOUNDARY CO CATALOG "A" MODEL A-6077-A WITH TYPE "A" LIFT HANDLE & TYPE "F" LOCKING DEVICE OR APPROVED EQUAL - 2 REQUIRED

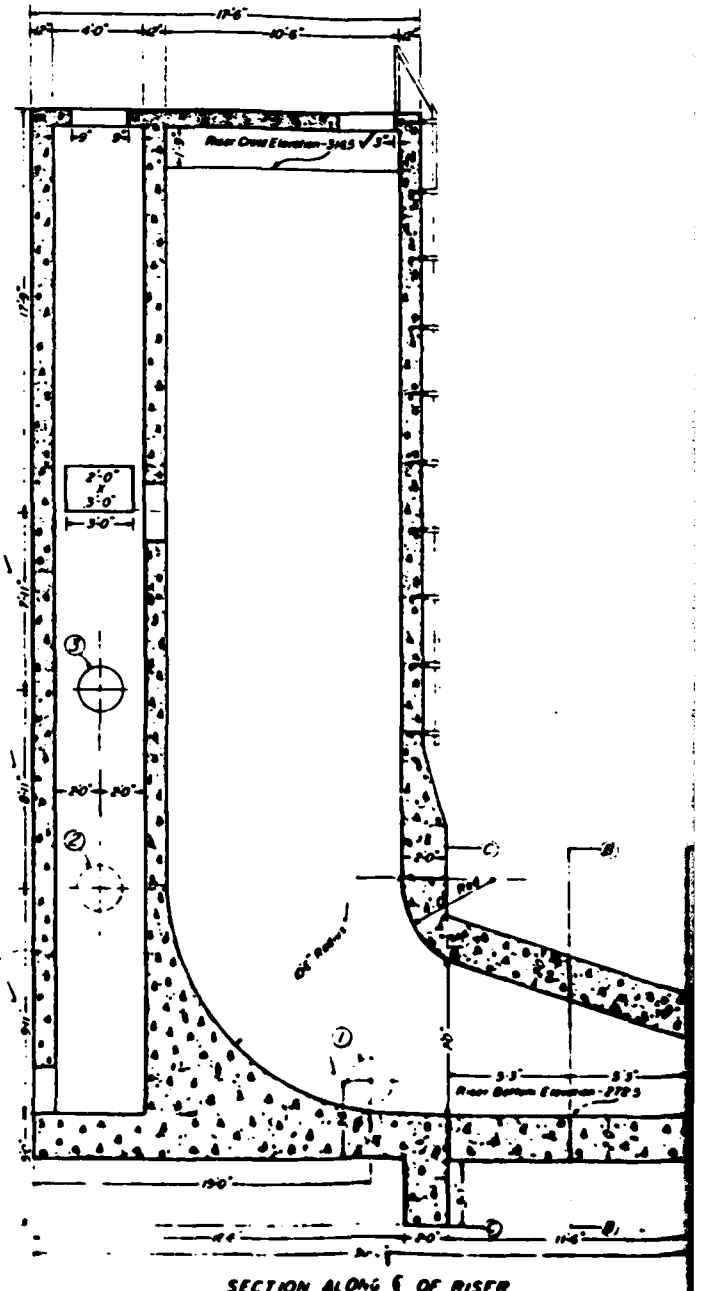
NEENAH MODEL R-6777-A INSTALLED

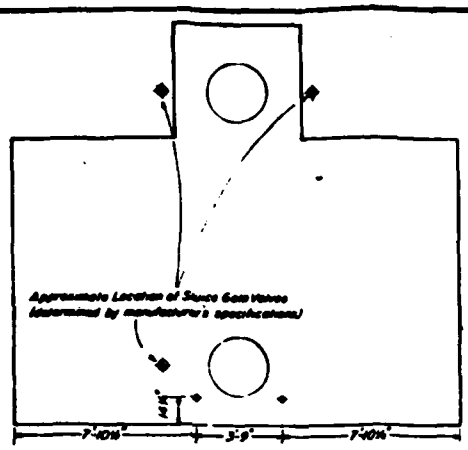
SLUICE GATE NOTES

1. 3-24" Diameter Sluice Gates - Rodney Hunt 280 Series or Approved Equal INSTALLED
2. Flat Frame
3. 7" I-pipe Wall Thimble 1-84" Long, 2-12" Long (120° Diameter)
4. Seating & Unseating Head - 42°
5. Rising Stem, Threaded Portion Bronze
6. Stem, Stem Guides & Lifting Device Sized & Spacing According to Manufacturer's Specifications
7. (1) LOCATED ON OUTSIDE OF MAIN RISER AS SHOWN
8. (2) & (3) LOCATED ON OUTSIDE OF COLD WATER RELEASE HOUSING AS SHOWN

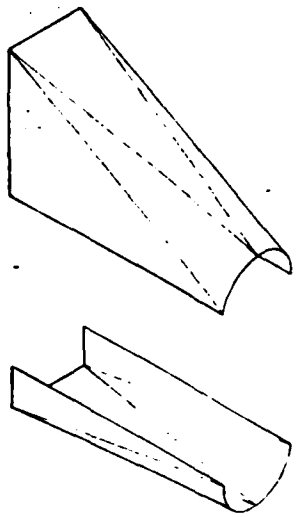




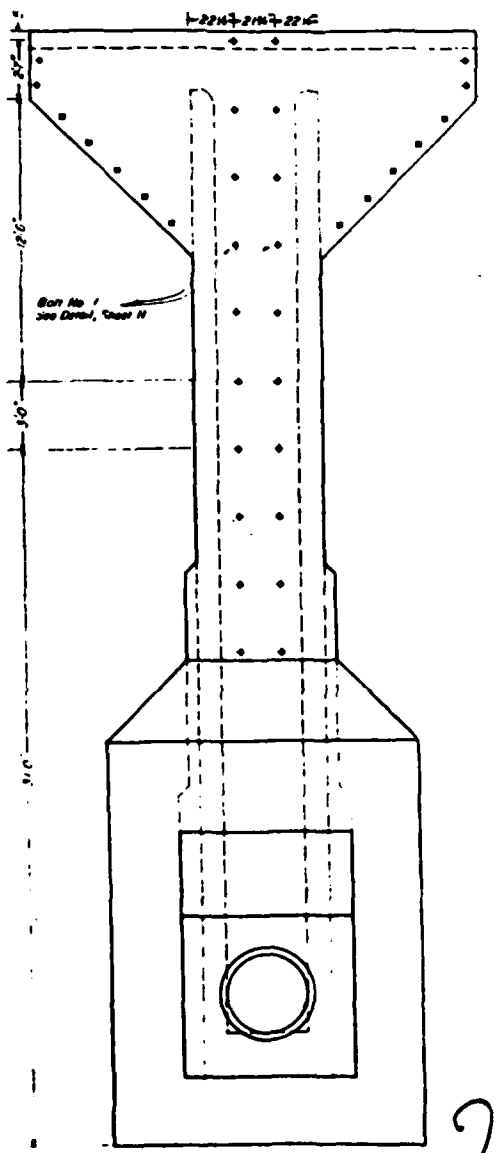




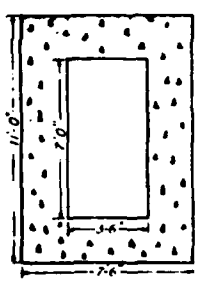
PLAN VIEW



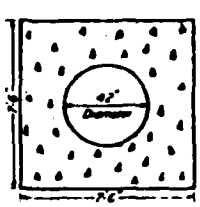
ISOMETRIC



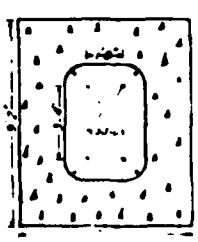
DOWNSTREAM ELEVATION



SECTION C-C



SECTION A-A



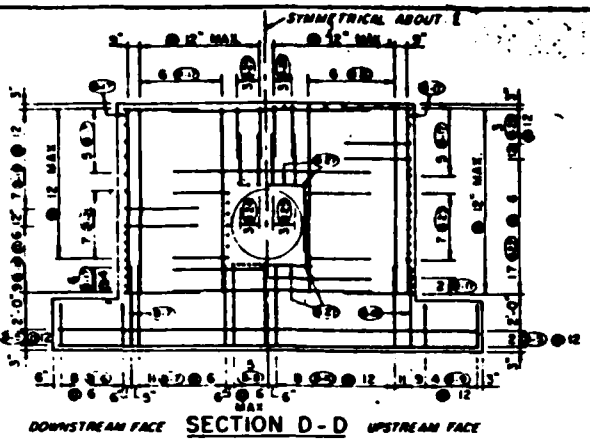
RISER STUB DETAILS

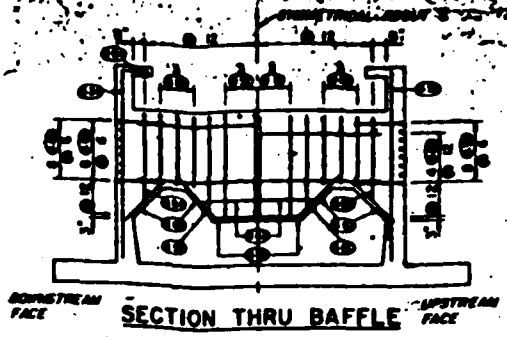
AS BUILT

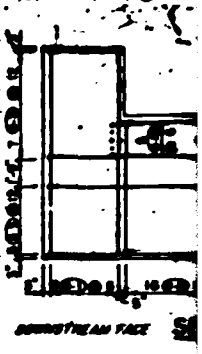
RISER DETAILS
UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO 1

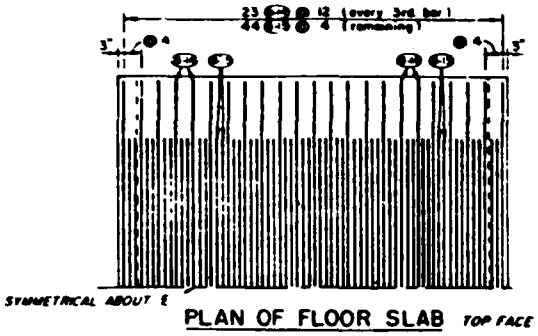
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

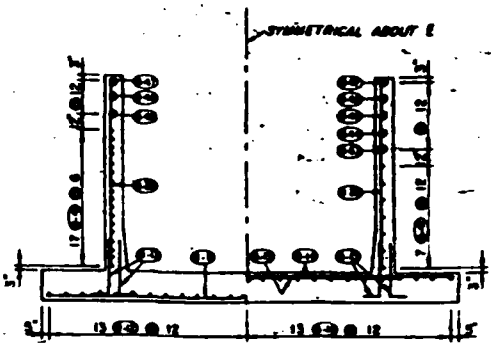
MD 442-PC-9

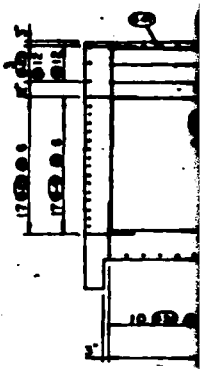


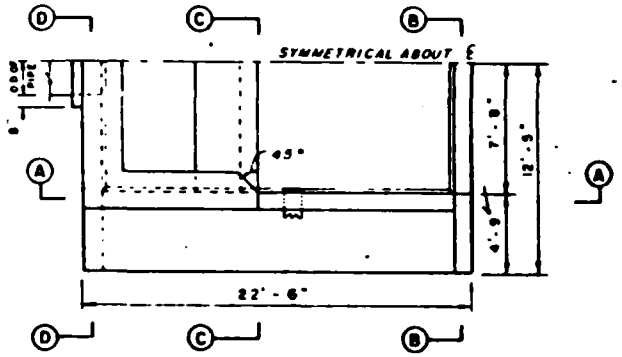


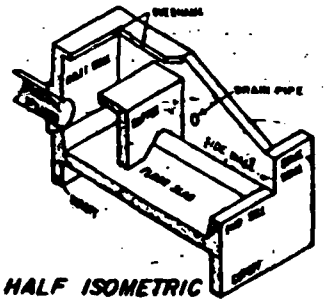


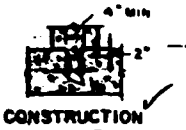


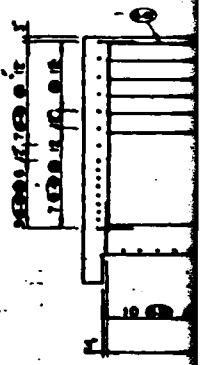


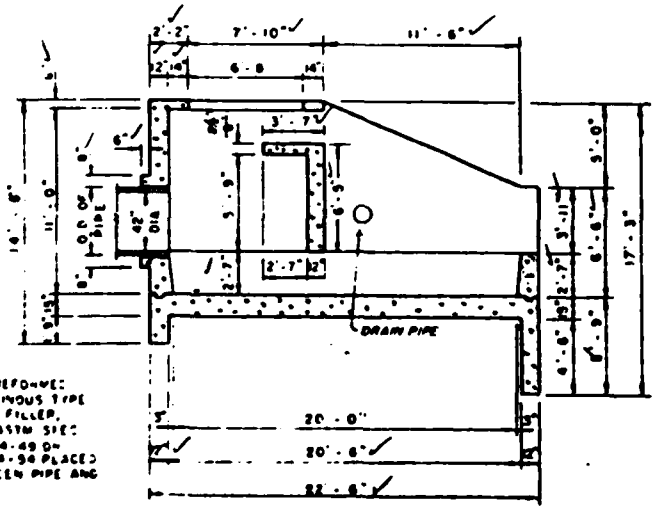




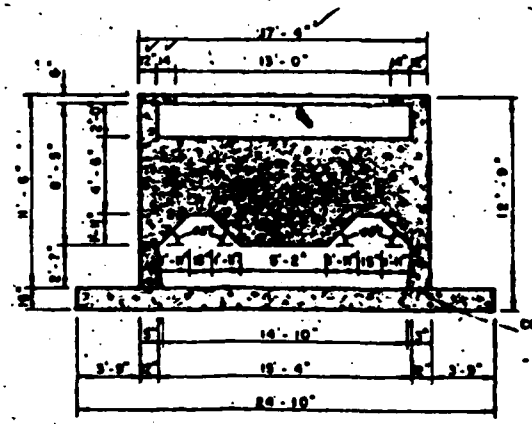


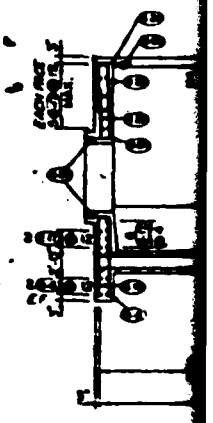




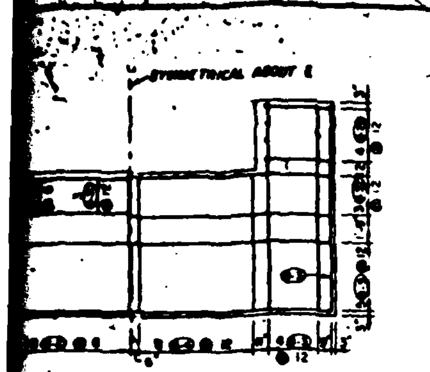


½" PREFORMED BITUMINOUS TYPE JOINT FILLER, PER ASTM SPEC: D-544-49 OR D-994-50 PLACED BETWEEN PIPE AND BASIN

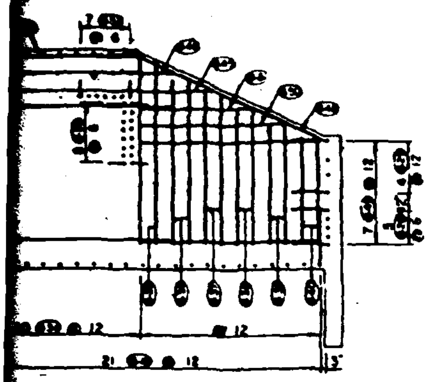




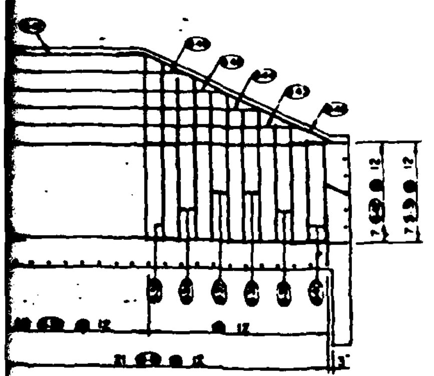
MAX. ALLOWABLE DISCHARGE = 275 CFS	GRADE DIA. OF PIPE: 24" MIN. - 48" MAX.	GENERAL NOTES SEE SHEET #



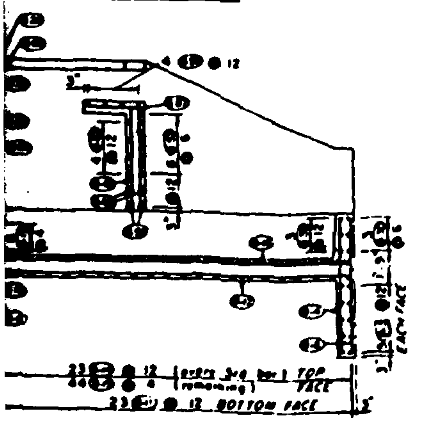
SECTION B-B *UPSTREAM FACE*



SECTION A-A *OUTSIDE FACE*



SECTION A-A *INSIDE FACE*



SECTION ON ℄

FOR DETAILS OF DRAIN PIPE SEE SHEETS 6

STEEL SCHEDULE

MARK	LOCATION	QUAN	SIZE	LENGTH	TYPE	A	B	TOTAL FT
B-1	CUTOFF	18	8	11-9	1			211 50
2		32	8	7-9	1			248 00
3		10	5	11-9	1			117 50
4		16	5	7-9	1			124 00
B-5		14	5	24-6	1			343 00
6		16	6	2-6	1			40 00
7		24	6	4-6	1			108 00
8		9	6	5-9	2	4-9	1-0	51 75
9		8	5	2-6	1			20 00
B-10		18	5	4-6	1			81 00
11	FLOOR SLAB	23	5	24-6	1			563 50
12		25	5	22-0	1			550 00
13		84	5	3-10	2	2-10	1-0	322 00
14		23	7	24-6	1			563 50
B-15		44	8	17-3	1			759 00
16		25	8	22-0	1			550 00
17	INLET WALL	34	5	11-0	1			374 00
18		18	6	6-1	2	4-0	2-1	109 50
19		14	5	6-1	2	4-0	2-1	85 17
B-20		12	5	12-9	2	11-0	1-9	153 00
21		14	6	4-3	2	3-3	1-0	59 50
22		40	7	7-1	2	4-6	2-7	283 33
23		14	5	3-3	1			45.50
24		6	5	4-0	2	3-0	1-0	24 00
B-25		12	5	3-0	1			36 00
26		6	5	4-9	2	3-0	1-9	28 50
27		8	5	4-0	1			32 00
28	WING WALLS	10	6	4-9	2	2-10	1-11	47 50
29		8	5	5-9	2	3-9	2-0	46 00
B-30		3	5	16-3	1			48 75
31		14	7	7-0	2	3-9	3-3	98 00
32		3	6	24-6	1			73 50
33	SIDE WALLS	20	5	11-0	1			220 00
34		20	5	12-9	2	11-0	1-9	255 00
B-35		4	5	10-6	1			42 00
36		8	5	9-9	1			78 00
37		8	5	8-9	1			70 00
38		8	5	8-0	1			64 00
39		8	5	7-0	1			56 00
B-40		8	5	6-3	1			50 00
41		48	5	10-9	1			516 00
42		14	7	11-0	1			154 00
43		2	5	18-3	1			36 50
44		2	5	15-9	1			31 50
B-45		4	5	13-6	1			54 00
46		4	5	11-3	1			45 00
47		4	5	8-9	1			35 00
48		4	5	14-1	3	12-6	1-7	56 33
49		14	5	11-0	1			154 00
B-50		2	5	8-9	1			17 50
51		2	5	6-6	1			13 00
52	BAFFLE	46	5	3-7	2	2-7	1-0	164 83
53		16	5	15-0	1			240 00
54		2	5	8-4	2	5-3	3-1	16 67
B-55		6	5	7-1	2	4-0	3-1	42 50
56		2	5	8-7	2	5-6	3-1	17 17
57		5	5	9-1	2	6-0	3-1	45 42
58		4	5	5-0	1			20 00
59		6	5	4-0	1			24 00
B-60		2	5	5-6	1			11 00
61		5	5	6-0	1			30 00
62		2	5	7-0	1			14 00
63		8	5	3-6	1			28 00
64	OVERHANG	2	5	7-6	1			15 00
65		1	5	14-0	1			14 00

QUANTITIES *THIS SHEET ONLY*

REINFORCING STEEL

NO 5 BARS 2470.3 LIN FT 5705 5 LBS
NO 6 BARS 489.8 LIN FT 735 7 LBS
NO 7 BARS 1098 8 LIN FT 2245 9 LBS
NO 8 BARS 1768 50 LIN FT 4721 9 LBS
TOTAL 13,409.0 LBS

CONCRETE
CLASS "B" TYPE I 62 7 CU YDS

0 1 2 3 8 FEET
SCALE

AS BUILT

UPPER ROCK CREEK WATERSHED
MONTGOMERY COUNTY, MARYLAND
MULTIPLE PURPOSE DAM, SITE NO. 1
IMPACT BASIN DETAILS

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

T O Fuchy 11/68
M HARCLICH
Lew Beck

C-10

MD 442-P

2

APPENDIX D

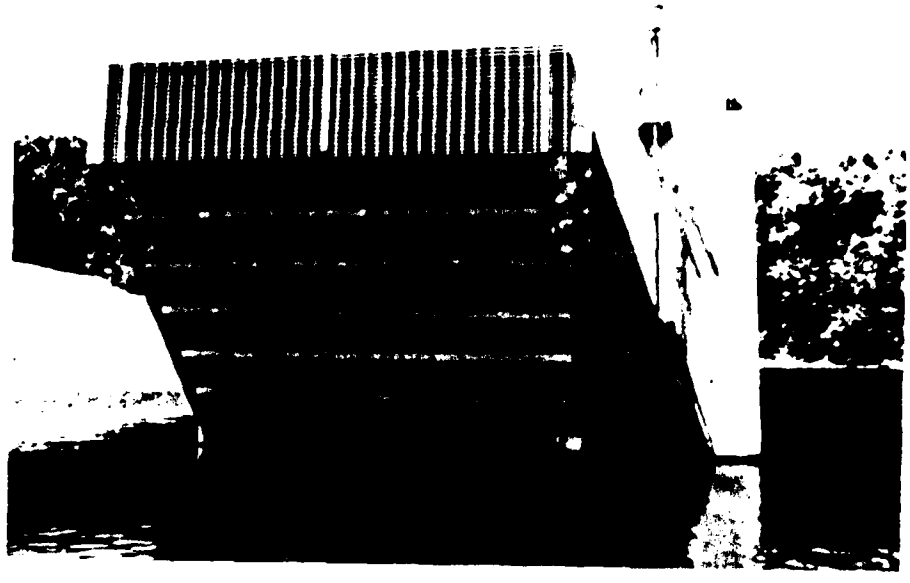
PHOTOGRAPHS

UPSTREAM FACE

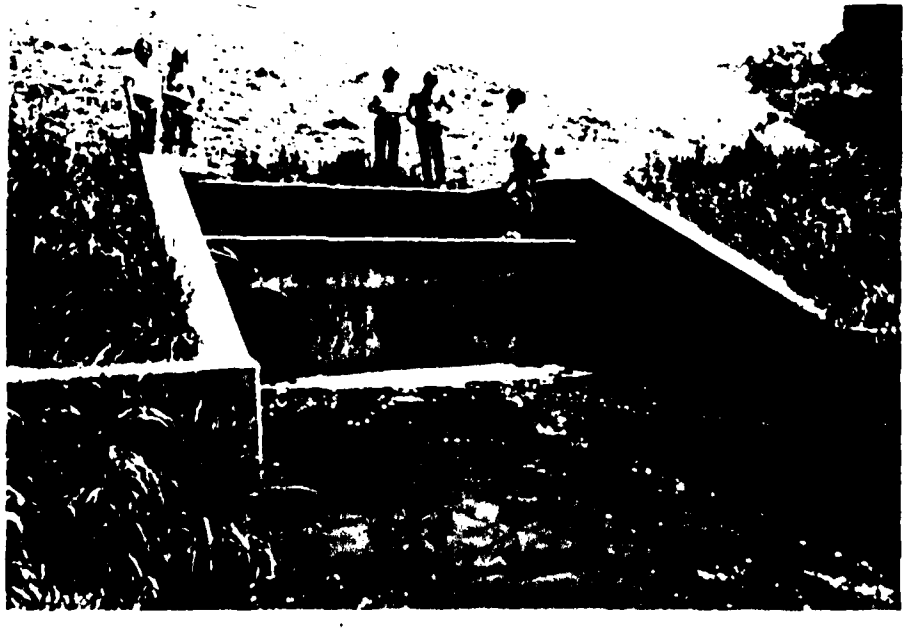
DOWNSTREAM FACE

TOP OF DAM

DOWNSTREAM



INTAKE TOWER



IMPACT BASIN

APPENDIX E

ANALYSES

Contents

Sheet E-2 Snyder's Unit Hydrograph

E-3 Data From Design Report Review

E-4 Stage - Storage Data

E-5 Emergency Spillway Rating Curve

E-6 thru E-9 Computer Data

Snyder's Unit Hydrograph

from Baltimore District Data

Zone 33 → Ct = Plate K

Cp = 1.25

use: $t_p = 2.5(L L_{CA})^{0.3}$ where L and L_{CA} are in miles

$t_p = 2.5(8.5 \times 3.3)^{0.3} = 6.8$ hrs.

where: L = 22.53 inches = 8.5 miles

L_{CA} = 8.75 inches = 3.3 miles

input: $t_p = 6.8$ and $C_p = 1.25$ into program

W Card t_p field 1, C_p field 2

M Card 1 field 1, 1 field 2, 10.23 fields 3 and 5, 1 field 9

from Hydromet 33, Precip. PMP Index = 24.3 inch, Zone 6

	read	R_6	R_{12}	R_{24}
P card		112%	122%	130%

T Card 1 field 7, .05 field 8

From Design Report Review

D. A. = 12.23 mi^2 = 7827 ACRES
Tc = 5.3 hrs.
RCN (AMC II) = 82

Emergency Spillway

width - 150 feet
Side slopes - 1:1
level section - 30 feet
exit slope - 2.5 %
entrance slope - 1%; length 120 feet

Stage - Storage Data

	(MSL) Stage*	Surface Area, Ac.**	Cumm. Storage Ac.-Ft.
Sediment Pool	286.2	35	261
Recreation/Normal Pool	298.0	56	785
Riser Crest	314.5	92	1195 + 785 = 1980
Emerg. Spillway Crest	334.5	189	3894 + 785 = 4679
Design High Water	338.7	217	4380 + 1164* = 5544
Top of Dam	347.9	219	6690 + 1164* = 7854

#E ← CARDS → $S

*1164 is Cum. Volume @ 10 day drawdown elev. 304.1

** from page 10 and 11, sheets 4 and 5 Section III of Design Report

Emergency Spillway Rating Curve

Stage	Discharge (page 29, sheet 23 section III of Design Report)
334.5	0
336.0	500
338.0	2300
340.0	5200
344.0	13,300
348.0	24,600
↑ Y4 Card	↑ Y5 Card

from Emergency Spillway Rating Curve - Discharge @ top of dam elev. 347.9 = 24,300 cfs.
neglecting ≈ 290 cfs. thru riser (principal spillway)

S.C.S. Freeboard Hydrograph 2.5x6 hr. pt. rainfall = 32 inches
Areal Rainfall = 27.12 inches
Peak Inflow = 30,500 cfs

Emergency Spillway n value design = 0.040
Resulting Hydrograph is routed through the structure with the starting elevation of 304.1 which represents a 10 day drawdown time from the max. elevation attained by the 100 yr. freq. 6 hr. design storm.

The resulting outflow peak is 21,400 cfs.

```
1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********************************
     1                 A1       SNYDER UNIT HYDROGRAPH,FLOOD ROUTING,AND DAM OVERTOPPING ANALYSIS
     2                 A2       UPPER ROCK CREEK SITE#1,MONTGOMERY COUNTY, MARYLAND
     3                 A3       FOR 50% AND 100% PMF STARTING ELEVATION AT NORMAL POOL
     4                 B     58       0      30       0       0       0       0       0      -4       0
     5                 B1     5
     6                 J      1       2       1
     7                 J1   .50    1.00                                             1
     8                 I      0       1
     9                 I1       CALCULATION OF PMF RATIOS TO LAKE BERNARD FRANK                        1
    10                 M      1       1   12.23           12.23
    11                 P             24.3     112      122     130                  1     .05
    12                 T
    13                 N   6.80    1.25
    14                 X   -1.0   -0.05     2.0                                    1
    15                 Y      1       2
    16                 I1       ROUTED FLOWS THROUGH LAKE BERNARD FRANK
    17                 V                                1       1                785      -1
    18                 V1     1
    19                 V4 334.5   336.0   338.0   340.0   344.0   348.0
    20                 V5     0     500    2300    5200   13300   24600
    21                 $S   261     785    1980    4679    5544    7854
    22                 $E 286.2   298.0   314.5   334.5   338.7   347.9
    23                 $$ 334.5
    24                 $D 347.9     3.1     1.5     576
    25                 I     99
```

COMPUTER INPUT DATA

SNYDER UNIT HYDROGRAPH/FLOOD ROUTING AND DAM OVERTOPPING ANALYSIS
UPPER ROCK CREEK SITE#1 MONTGOMERY COUNTY, ALA. MAR0060
FOR 50% AND 100% PMF STARTING ELEVATION AT NORMAL POOL

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPPT	NSTAN
58	0	30	0	0	0	0	0	-4	0
			JOPER	NRT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIOS= .50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF PMF RATIOS TO LAKE BERNARD FRANK

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPPT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	12.23	0.00	12.23	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.30	112.00	122.00	130.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .807

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRTS	PTIOV	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 6.80 CP=1.25 NTA= 0

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 26 END-OF-PERIOD ORDINATES, LAG= 6.77 HOURS, CP= .76 VOL= 1.00

87.	245.	364.	449.	519.	581.	637.	688.	736.	780.
823.	863.	900.	909.	881.	842.	801.	757.	711.	662.
608.	549.	484.	407.	310.	156.				

END-OF-PERIOD FLOW

0 HO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	HO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
								SUM		25.49	23.65	1.84	362407.
										648.**	601.**	47.**	10403.8**

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED FLOWS THROUGH LAKE BERNARD FRANK

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPPT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IPER	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	785.	-1

STAGE	334.50	336.00	338.00	340.00	344.00	348.00
FLOW	0.00	500.00	2300.00	5200.00	13300.00	24600.00
CAPACITY=		261.	785.	1986.	4679.	5544.	7854.
ELEVATION=		286.	298.	315.	335.	339.	348.

CREL	SPILD	COOH	EXPH	FLEVL	COOL	CAREA	EXPL
334.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
342.3	3.1	1.5	526.

PEAK OUTFLOW IS 6450. AT TIME 25.50 HOURS

PEAK OUTFLOW IS 17292. AT TIME 23.50 HOURS

********** ********** ********** ********** **********

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .50	RATIO 2 1.00
HYDROGRAPH AT	1	12.23	1	9325.	18650.
		(31.68)		(264.06)(	528.11)(
ROUTED TO	2	12.23	1	6450.	17292.
		(31.68)		(182.64)(	489.66)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	298.00	334.50	347.90
STORAGE	785.	4679.	7854.
OUTFLOW	0.	0.	24317.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	340.62	0.00	6025.	6450.	0.00	25.50	0.00
1.00	345.41	0.00	7230.	17292.	0.00	23.50	0.00

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 80
****

APPENDIX F

GEOLOGY REPORT

GEOLOGY REPORT

UPPER ROCK CREEK WATERSHED SITE NO. 1
(LAKE BERNARD FRANK DAM)

The Engineer's Design Report prepared for this project contains a geology report which is considered adequate for this Phase I study. Appropriate excerpts from the report are included herein. It should be noted that regional geologic studies have been performed since the preparation of the design report and the Sykesville Formation is presently mapped as Boulder Gneiss within the Wissahickon Formation.

The Engineer's Design Report states "The site is located in the Fall Line, the natural boundary separating the Piedmont physiographic province and the Coastal Plain province. The area has moderately steep sided valleys with about 100 feet of relief.

The entire area of the dam and reservoir site is underlain by the Sykesville Formation. The age of the Sykesville Formation is uncertain. The Sykesville Formation is a granitic appearing schistose rock containing numerous inclusions, quartz pebbles and stringers, and garnet. The rock in unweathered condition is hard, dense and has a medium gray-blue color. The weathered rocks have shades of brown and gray-brown colors.

Strike and dip readings taken on outcrops indicate the schistosity has an average dip about 80° northwest and strikes about north 5 degrees east. The dip varied between 65 and 85 degrees and strike varied between north 5° west and north 10° east. There is no unusual variation in strike and dip to indicate any major degree of movement anywhere in the foundation area.

The Sykesville Formation has a gradational contact with the Wissahickon Formation, albite-chlorite faces to the west. The dam site is located near the contact and is probably in what is considered the transitional zone.

Rock on the south side of the creek (left abutment facing downstream) is highly weathered and fractured. Rock is fractured to depths up to 60 feet. Outcrops on the south side of the creek downstream from the dam are generally soft and highly weathered. Rock exposed by test pits in borrow area south of the creek have indications of some slight movement. There is no way to measure the movement.

Rock north of the creek (right abutment) is less weathered and fractured. Weathering and fracturing generally was less than 10 feet. Core recovery in drill holes on the right abutment generally ran over 90%. Outcrops on the north side of the stream are hard and nearly unweathered.

The soils overlying bedrock on the slopes, in the project area and hill tops, are derived from weathering of the bedrock. The materials on the left abutment and in borrow areas 1 and 2 vary in thickness from 6 to more than 30 feet. These materials consist mainly of fine sand and silt. Clay is present in small amounts. Soft gravel size fragments of weathered schist are present and become more prevalent with depth. The right side of the creek in the foundation area has 4 feet or less of weathered material similar to that found on the left abutment.

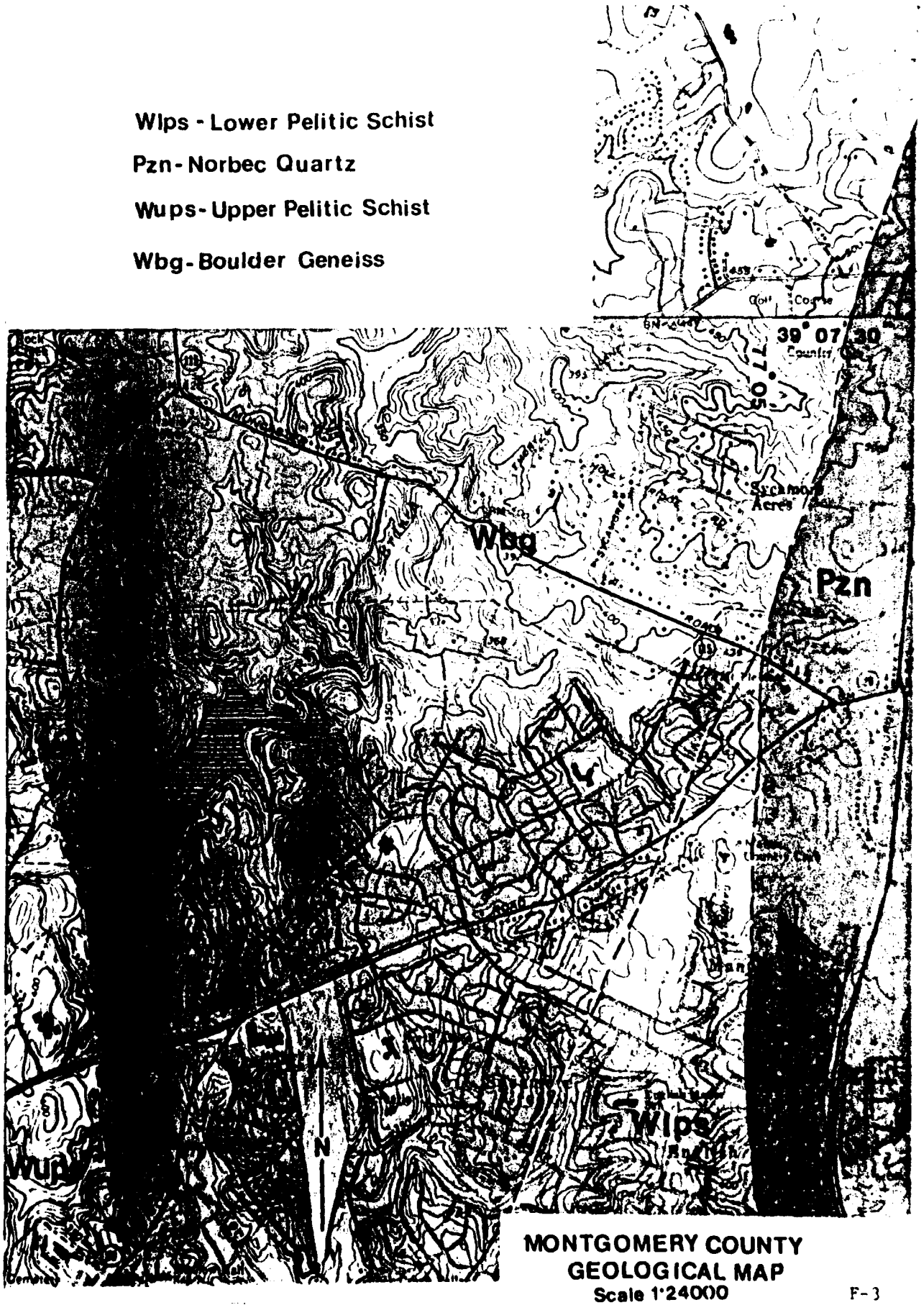
The valley bottom is filled with a layer of alluvial material about 6 to 10 feet thick. The material is mainly fine sand, silt and some clay. There are scattered lenses of gravel with some cobble and boulders. The alluvium lies on soft disintegrated schist 2 to 3 feet thick."

Wlps - Lower Pelitic Schist

Pzn - Norbec Quartz

Wups - Upper Pelitic Schist

Wbg - Boulder Geneiss



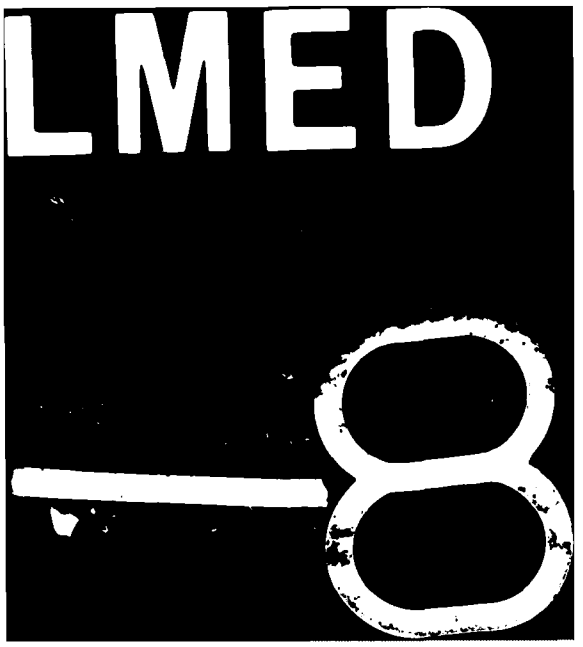
MONTGOMERY COUNTY
GEOLOGICAL MAP
Scale 1:24000

REFERENCES

1. Dingman, R. J. Meyer, G., and Martin, R.O.R., 1954 Water Resources of Howard and Montgomery Counties, State of Maryland Board of Natural Resources, Department of Geology, Mines and Water Resources; Baltimore, Maryland.

2. Geologic Map of Maryland, Maryland Geologic Survey, Compiled and edited by E.T. Cleaves et.al.; 1968.

3. Engineer's Design Report, Upper Rock Creek Watershed. Protection Project, Dam No. 1, Montgomery County, Maryland; U.S.D.A., Soil Conservation Service, Engineering and Watershed Planning Unit, Upper Darby, Pennsylvania; March 1965.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